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SIERRA CLUB BULLETIN

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SIERRA CLUB BULLETIN

VOLUME 31 DECEMBER, 1946 NUMBER 6

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SIXTEEN ILLUSTRATIONS

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SIERRA CLUB BULLETIN

VOLUME 31 NUMBER 7

DECEMBER, 1946

An Ascent of Half Dome in 1884

By A. PHIMISTER PROCTOR

With an Introduction by Francis P. Farquhar

In J. M. Hutchings' compendium of Yosemite lore, In the Heart of the Sierras, *published in 1886, there is an account of "A Thrilling Adventure," which begins as follows:*

"During the severe winter of 1883-84 the ice and snow sliding down the smooth back of the great Half Dome, carried with it over four hundred feet of the rope Anderson had put up with so much care and risk, and several of the iron eye-bolts with it. This deprived every enthusiastic climber of the pleasure of ascending to its wondrous summit, and of obtaining the unequalled view from that glorious standpoint. No one seemed imbued with sufficient ambitious courage to replace it—Anderson having passed away to his rest.

"But, just after sunset, one evening of the ensuing summer, every resident of the Valley, familiar with the fact of the rope's removal, was startled by the sight of a blazing fire upon its utmost crest; and all kinds of suppositious theories were indulged in concerning such phenomena. No one knew of anyone contemplating so hazardous a venture. What could it mean?

"Eventually it transpired that two young gentlemen, who were summering in the Sierras, hunting, fishing, reading, and sketching, had been missed some days from their camping-ground in the

Valley; and, therefore, there was the possibility that these might have unknowingly attempted to ascend it, and succeeded. But that possibility shared the companionship of another, which filled every mind with consternation; that they were up there, and could not come down; that the fire seen was at once a signal of distress as well as of success, and a call for help.

"Before daylight the following morning, therefore, four of us, well supplied with ropes, extra bolts, and other essentials, were upon the way for their deliverance. At Snow's, however, we met the daring adventurers; and found that, although they had made the perilous climb up, they had also accomplished the descent in perfect safety. These twin heroes were Mr. Alden Sampson, of New York City, and Mr. A. P. Proctor, of Colorado."

Hutchings continues with a "recitative of their danger-defying exploit" furnished by Mr. Sampson.

The episode thus described took place over sixty years ago. One of the participants, Alden Sampson, after many years of continued interest in the mountains of the West, passed from the scene several years ago. The other, Phimister Proctor, long known in Europe and throughout America for his dynamic sculpture, has recently, by request, written his own version of the "thrilling adventure;" and at the Bohemian Club, where he resides, his eyes sparkle as he demonstrates with a wave of the arm the technique of throwing the lasso that made possible the successful outcome of the "danger-defying exploit"—over sixty years ago!

AFTER a good summer and fall of sketching at Grand Lake and Flattop Mountain my horses' heads were, in the autumn of 1883, pointed toward Denver. I had taken a studio on Laramie Street preparatory to a winter's work in engraving and painting, and was about ready to put out my shingle when, to my surprise, Alden Sampson, of New York, with whom I had been on a couple of hunting trips, dropped in. He was anxious for a sketching and hunting trip and invited me to join him. As prospects for making a living in Denver that winter were exceedingly slim, I accepted the invitation with alacrity. It was December, however, and the Rockies were out of the question and Mexico at that time was infested with bandits. We finally decided on California. I looked forward to new scenes for sketching, new experiences, and some hunting. So, with sketching and hunting outfits, we boarded a Santa Fe train for Los Angeles.

In those days Los Angeles was a picturesque, semi-Mexican town. Its streets were paved with mud ankle deep. We stayed at a hotel with a patio filled with tropical fruit and flowers. Having just come out of the Rockies with their two or more feet of snow, we found the contrast striking. Where the finest buildings now are, were most of the corrals where we bought our horses. We chose five: Spider, Buck, Pinto, Pink, and Rattlesnake—"Rattler," for short. The last was a snake, for sure.

We left Los Angeles as soon as we had assembled our paraphernalia. Our first night out of Los Angeles was spent in Pasadena. I can remember only half a dozen houses in the place then, but, even so, pack horses were quite a novelty, and we created some excitement. We had decided to go up the Wilson Trail until the rainy season was over, and the next afternoon saw our outfit going up the zigzags.

After a pleasant stay of a couple of months on the Wilson Trail, we packed into the Mojave desert, hunting antelope and sketching. In six months we traveled 1500 miles through California and wound up in Yosemite.

"That's Half Dome," said a voice, "right across the Valley." I was sitting on Overhanging Rock, with my feet hanging over the Yosemite Valley, 3,000 feet below. Turning I saw, standing near by, a man who turned out to be Galen Clark, one of the pioneers of the valley. He told us how, several years before, an intrepid sailor named

Anderson had with great labor and danger put up a rope cable on Half Dome. A year or so before our advent, he said, Anderson had died, and during the past winter an avalanche had taken down most of his cable and had torn out many of its supporting pins. "Now," he said, "we are waiting for some Swiss Alpine climbers to come over and replace the rope."

At that last remark our ears went forward. The thought passed through both our minds at the same instant: "No foreigner will do that job till we have a try at it."

We camped half a mile from Glacier Point for some days, enjoying the wonderful valley views, then moved to Little Yosemite where we established a base for our attempt on Half Dome.

A day or so later we were standing at the bottom of the fifteen-hundred-foot, smooth, granite pitch. The only side it was possible to climb appeared to be as smooth as writing paper. At our feet lay the remains of the bale-rope cable which had been torn down by the snow slide.

As we studied the face of the mountain, we saw how the dare-devil sailor had accomplished his work. He had climbed up the steep grade wherever there was the slightest toe-hold; then, when he could go no farther, he reached up as far as he could and drilled a six-inch hole. In this he fastened a bolt one-half inch in diameter which stuck out from the rock about two inches over all. One end of the bolt was bent into a ring through which he fastened his cable. This he had fashioned by stringing a number of bale ropes until the cable was about three inches in diameter. To keep it from tangling, he bound it every foot. When each pin was well secured in the granite, he attached the cable to the pin ring by a smaller rope. Then, standing on that pin he would drill another hole and again attach the cable.

Wherever it was possible to climb, and he was a past master at that game, he went without pins, taking advantage of toe-holds. Then, when the rock was too smooth and steep, another pin was put in and the cable fastened as he went. This helped him to come and go. He had built a cabin at the nearest spring, a mile away, where he lived and kept his forge for making bolts.

We returned to camp that night after our tour of inspection to get ready to tackle the cliff in the morning. We had carried with us all

of our pack and picket ropes that could be spared, and both of us were looking forward to the attempt with considerable anxiety.

Everything ready, we started on the ascent. The first two hundred feet were accomplished, all the rope hauled up and fastened, and then our troubles began in earnest. We tried every expedient we could think of, one after the other, to get up that smooth steep rock. We could see clearly enough now why all the others had failed, for no matter how hard we tried we kept slipping back. Yet, forty feet or so above our heads a rock jutted out. If we could only reach it! Beyond, the surface looked rough enough for finger-holds for some distance. But there was no joy in that, for we couldn't get there. We had failed! There was one satisfaction—no one would know of our failure, for we had told no one of our intentions. In silence we began to gather up our ropes.

Suddenly I had an inspiration. "I'll lasso it," I yelled. No one had thought of that—the only possible solution, except for Anderson's laborious method. Luckily I was a pretty fair hand with a lariat. Tying a loop on a lash rope, I made a throw. After several false pitches I finally got the range. The knot caught in a crack of the rock and stuck. It didn't look particularly good to me, but I started crawling up the steep slope supporting my weight on the rope. Just before I could grasp the projection, the knot slipped and down I slid for about twenty feet before it caught again. This gave me a bad scare, and while I was collecting my scattered nerves, Sampson climbed up. Soon we were both standing on the jutting rock and could survey the problem ahead.

We found that the slide had not only carried away all of the rope and some of the pins but had loosened some of the pins that were left. This was an unlooked for handicap. Wherever a pin had been pulled out, the only way to reach the next one was to lasso it and then pull oneself up to it with the help of the rope.

As we proceeded we found that some of the pins had been bent over by the snow and were difficult to rope. Often my loop would roll over a ring twenty times before I caught it, even though I had made a good throw. Several of the pins pulled out when my weight was put on the rope. Moreover, our ropes had been used in packing and picketing horses for the past six months and were rather thin and frayed. By this time I was barefoot, for I had discarded my shoes which had a poor set of hobnails.

When I reached a pin, my method was to climb up on it, always leaning against the wall of the mountain, and hook my big toe over the pin. That was my only support. I would straighten myself up slowly, still leaning against the face of the mountain, and throw for the next pin. And I repeat, I was standing on a two-inch pin, with my big toe the only support between me and the valley below. There was never a handhold. The only way that I could get my big toe over the ring was to double up like a jackknife, put my toe on the fingers by which I was holding to the pin, and when I was balanced all doubled up, pull my fingers out with all my weight still resting on them. This was not too easy, as I soon found out. Early in the day my right glove got away from me and went tobogganing down the mountain. This made changing my weight from fingers to toe much more painful.

We at length reached a place where there were no pins, but there were a few rough surfaces. It was now Sampson's turn to go ahead. I doled out the belt rope as he cautiously crawled aloft. If he had slid down past me there wasn't a chance in the world that I could stop him, and we would both have been swept to the bottom. Finally, he reached a ledge where he was compelled to slant off to the side, and this was impossible without something to hold to. As he hung on desperately to small cracks in the rock, he worked a piece of baler-rope from his pocket and tied it to a small bush just above him. I held my breath. Then, putting just enough pressure on the rope to keep himself from slipping, he moved cautiously along till the angle was too great and he had to let go of the rope. But he managed to drag himself to a little hump in the rock, where he cupped his hand over it and clung for several minutes to get his breath. Several yards farther he reached a safe spot, where he fastened the rope and I pulled up to him.

By noon we had reached the only ledge on the mountainside where we could rest and eat lunch. It was all of six inches wide and had been forced away from the main rock so that we could push a leg down in it and rest without holding on. I tell you, that felt good.

By the end of the first day we had made about half of the distance. Just before sunset we slid down the cable, mounted our horses and rode to camp some three miles away. My feet were mighty sore from climbing about on the rocks. To tell the truth, I looked at that mountain with a heap of dread, though I didn't let on. Later I found out

that Sampson was scared, too, but as I didn't show any signs of fear, neither would he.

Bright and early the next morning we were back at the starting place with all the rope we possessed. It wasn't hard to reach the upper end of the cable, but there our troubles began. It was tedious work pulling all the spare rope after us. I don't know the exact pitch of the mountain, but everything slipped off the moment we let go of it. Every minute we had to lean against the mountain, which always seemed trying to push us away.

From then on, the surface was the deadly smoothness that I dreaded—there were few pins, and I had to go ahead with the lasso. About a hundred and fifty feet above the spot where I took the lead, I was clinging by my big toe to a pin and lying on my side against the steep cliff, trying to rope the next pin. There was a wind blowing, and this made roping difficult. Finally the rope caught. I put my weight on it, and it held. Then just as I was about to let go on my toe-hold I gave another yank and out came the pin! It rolled down past me, still in my lasso loop. That gave me a chill, and no mistake.

Luckily the next pin was only five feet above the one I had just pulled out. But the tedious work had to be done all over again. After half an hour of trying, the loop finally caught on that pin. It was a great relief, for if the little pin I was then on had given way, or if my knee had caved in, it would have been all over, for there was nothing between me and the bottom of the canyon.

The next pin was the worst of all, for it was thirty-five feet above me on a ledge of rock which stuck out over me about two feet and a half. It seemed next to impossible to make the rope fly up those extra perpendicular feet and hold. We both yelled when the loop finally settled over it. Right there was the fiercest spot I had to conquer. I crawled up on hands and knees, holding like grim death to the rope, until I got to the ledge. There I had to pull myself up on the rope hand-over-hand until I got hold of the pin with my fingers. Then I had to worm myself up over the pin in the "jack-knife" movement while I held my weight on the pin with three fingers of my right hand. With my right big toe over my fingers, I slid my body up against the face of the mountain, first painfully yanking my fingers out from under my toe with all my weight on said toe! I lost some skin, but that couldn't be helped. As I stood leaning

against the sloping granite catching my breath, that hellish old mountain seemed more than ever determined to push me off.

Once my right toe was hooked over the little pin, there it had to stay. I couldn't change my position, for there was absolutely nothing above to cling to. But before I could catch the next pin, which was a long throw above, my leg trembled so that I simply had to go down—and that was even more difficult than going up! I had to push my index finger under my toe to get hold of the pin, meanwhile hanging over that empty mile of space. It seemed almost impossible to keep from pitching headlong into the blue. I had to climb up over that hellish corner three separate times before I succeeded in roping that next pin. Every time, under the intense strain, my leg would begin to quiver, and I knew that I would either have to go down or get a cramp and fall down. How I cursed the day that I undertook such a fool stunt.

At last, after an hour and twenty-five minutes of unbroken hades, my loop held. This pin still had a bunch of old rope caught around it, which made roping it difficult. Four times it caught, but when my weight was put on it the loop had slipped off. I was anything but happy as I put my weight on that worn rope and, on hands and knees, cautiously climbed up the polished surface of the rock. How anxiously I watched the rope for signs of giving way and the loop for signs of slipping off the pin. If either had happened, you wouldn't be reading this story. To the left, through the corner of my eye, I could see Little Yosemite 3,000 feet below, while at the right, bathed in purple mist, lay the grand Yosemite Valley. Below me, clinging to the face of the cliff, Sampson looked little bigger than a chipmunk. Curiously, while lying there against the side of the mountain I thought to myself, "Now I can face the biggest grizzly in the wilds."

Finally I reached a safe pin, and to it fastened the rope. Sampson climbed up then, and we pulled the cable after us. From here up we had to use about two hundred feet of our own rope to piece out the sailor's cable. There just wasn't enough to finish the job. Sampson still had some ticklish work to do, but we made the top at last.

The view from the top of Half Dome is, I suppose, one of the most wonderful in all America. The valley was spread out below us in all its blue, hazy beauty. We sat for awhile enjoying the wonders of the valley under the glow of the setting sun, and then built a fire

on the highest point in view of the whole valley, to let people know that Half Dome had been conquered! At last, reluctantly, we left, slid down the cable and reached safety just at dark.

There are times in a young man's life that a great experience changes it. Those two days on Half Dome were for me the divide between careless youth and serious manhood. My mind had been made up long ago to become an artist. There was nothing else for me in the way of a profession. Those hours of anxiety and danger, trying to accomplish something which in itself was of little value to the world, had crystalized in my mind the ideals that had vaguely been floating in it. After a month's visit in San Francisco with an artist friend, I returned to Denver and was soon launched upon the career that has claimed me ever since.

Sierraville Skilauf

By HOWARD R. KOCH

MOST of us who frequent Clair Tappaan Lodge every winter are so familiar with all the slopes and trails on Signal Hill and thereabouts that we are able to run them blindfolded—or at least sometimes seem to. Consequently, after the first few trips of a winter, during which he has limbered up his ailing ankles, knees, and shoulders, a skier sometimes notices surging within him a desire to try out his newly refreshed skills on some untracked slopes in the winter wilderness, a great curiosity about what is on the other side of the mountain, a desire—vain to some extent—to revel in the beauty of a winterland which is not accessible to his less talented and less hardy contemporaries.

Unfortunately, however, these desires are too often suppressed; there isn't enough time, the skier thinks, for a tour, or he isn't yet fully aware that in well-planned touring there is a maximum in enjoyment and a minimum of discomfort. So he finds himself wearing the same old groove still a little deeper in Signal Hill.

In early February of this year Dick Weber and I found that we had the time for a tour, and thought we would see how well we could plan it. We scanned the *Truckee* quadrangle and decided on a trip in a northerly direction from Donner Summit—so far north that we had to whip out the *Sierraville* sheet as well. We would check the condition of the Sierra Club's White Rock Lake Hut, all but unvisited during the war years, would climb Mount Lola, and would then schuss or stem (depending on our situation and the terrain) north and down into Sierra Valley.

We set out rather late in the morning, after loading our rucksacks with quite a bit more than a bare minimum of food, with a one-pound army stove, extra socks, a few other essentials, and your friend and ours, the down sleeping bag. It had been too good a friend, in fact, and accounted somewhat for our late start. But we didn't mind. Snow conditions were excellent, a light snowfall of the previous night having covered the pack with a few inches of dry new snow. As we moved on up the trail toward Boreal Ridge we could see plumes of powder swirling behind the skiers up on Signal;

it was a tantalizing sight, but we girded up what was left of our will power and hurried on.

The run down to Castle Creek was ideal; before we reached it we were beginning to get the feel of skiing downhill with a rucksack once again. As we descended, and then plodded on toward Peter Grubb hut, the sky took on an ominous look, but we were now too far from Signal Hill to be discouraged by mere weather. A quick descent from Castle Ridge dropped us to the hut where, after not too much deliberation, we decided to eat. The stove was in fine shape and threw out delightful warmth up to a radius of one foot.

It was snowing lightly after lunch, but observation wasn't too restricted and we made our way up the western slope of Great Basin Peak, keeping quite a bit higher than the normal, marked route. Once on the crest we found, as all ski tourers will once they have made the sacrifice, that the promised downhill run more than compensated us for the work expended in climbing so high on the ridge. The run did not disappoint us; we dropped down the northwest slope of the peak, avoiding the cliffs of the eastern slope, followed a course roughly paralleling the regular route but a mile to the east of it, and in steadily decreasing visibility climbed a last ridge and dropped to White Rock Lake. A few minutes' two-stepping brought us to the hut, just as dusk blended into night—and the snowstorm stopped.

Inside the hut we found the stove, particularly the pipe, in sad shape, and once more relied on the tiny Aladdin stove for a meager amount of warmth and for cooking. As I set to work hydrating the dehydrated potatoes, I heard a discoverer's shout from a far corner of the hut. Dick had found a box of a bran-type breakfast cereal in a food storage can. We later dated it back five years, and Dick commented, "Time improves this product little," meanwhile putting away two large canteen-cupfuls of the delicacy. He was then able to take the taste of it out of his mouth successively with noodle soup, beef, gravy, potatoes, and some delicious (to a ski tourer) steaming hot coffee. Over a couple of pipefuls of tobacco and in front of our simulated fireplace we skied the day over again, then hit the sack. Outside, the storm had snowed itself out; it was clear and cold, a high wind blowing across the frozen lake.

The last vestige of wind was stripping a thin veil of powder snow

from Mount Lola's crest as the sun's rays reached the hut again, and we had to climb the peak first thing. We started up through the low pass north of the lake, and then followed the western shoulder up toward the summit. We cached our skis about five hundred yards from the summit, and scrambled the rest of the distance over a combination of rock and ice. It was a sparkling day, and the air was unusually transparent. Shasta, Lassen, Nevada peaks whose names we did not know, Pyramid, even Mount Diablo—these stood out as we called their names. The nearer slopes of Great Basin Peak took on a ruggedness, in winter garb, that was deceptive. The east slope seemed to consist of giant terraces with sheer faces climbing to the sky, of great bastions waging a war with the snowy elements that sought to tear them down. In summer it seems hardly more than a gentle mountainside. Our destination to the north, Sierra Valley, lay bare of snow, but we knew that there was plenty of snow to tour over before we got there.

We returned to our skis and adjusted them and ourselves to the downhill run. Happily, we had left our packs far down the slope (this I whisper, for a ski tourer isn't supposed to mind a pack), so we enjoyed a wonderful run uninhibited by their weight. The snow was crusty for only a few yards, and then we hit beautiful powder snow, which lasted down to our packs, and far beyond as we descended into Pajaro Canyon. This proved to be the best skiing either of us had ever experienced in the Sierra. Dick was in great form, as usual, and made amazing and graceful long-radius turns, a frozen mist of powder trailing his flying skis. I came down, too.

From a series of open bowls, we worked our way down a subsidiary valley into Pajaro Canyon, which itself runs into the valley of the Little Truckee River. We one-stepped and two-stepped along the creek which runs through the canyon, searching for a place that would enable us to get water for our lunch without entailing our swimming for it. Nowhere was the stream accessible enough, but Dick, with the aid of some emergency wire, a canteen cup, and a ski pole, fashioned a contraption that would serve our purpose. Our luncheon fare, large chocolate bars and too many sardines in tomato sauce, didn't encourage us to linger long at our lunch spot, and we toured on until we had covered the six-mile length of the canyon.

At the Little Truckee, we deliberated whether to go a few miles west into Webber Lake or to try to make Sierraville that night. Al-

though Sierraville was about nine miles away, we decided to head for it; it was then about four o'clock in the afternoon. The river ahead of us provided no problem equal to the crossing of the Po, yet it was no easy task, either. We searched up and down stream for the best spot to cross, finally concentrating on a narrow place with a high bank of snow on our side, a low bank directly opposite. We tossed our skis and rucksacks across, committing ourselves, and then undertook the greatest running broad jump of all time—about ten feet, with only snow as a take-off.

Some forty-five minutes later we had reached the crest of a 1,000-foot ridge which was our last mountain obstacle, from which Sierraville could not be seen. In fact, we saw only a few signs of habitation, and began to wonder whether Sierraville was no larger than Hobart Mills, that is, a ghost town. We could only start down to see. Our logical route was due north between two ridges which ran directly toward the valley. The first part of the descent was fairly steep, but it became more gradual, and we found ourselves following a stream line, one-stepping through, under, and around deadfall. Fortunately we stumbled upon an abandoned logging road, and could again make good time.

We were now racing with the sun, the shadows growing longer by the minute, and we paused only often enough to determine whether we were on the right road or on any road at all. The snow grew sparser by the yard; here and there brown patches of earth appeared. Then rocks began to jut out of the snow on the road, and even hop-skip-and-jump skiing was no longer possible. We grounded ourselves, walked around a final monadnock that had been blocking our view, and saw the lights of what could be Sierraville and its suburbs. We finally arrived in the center of town, having been well heralded by the town dogs.

As far as we could see, the center of town consisted of the Globe Hotel, an establishment which had very obviously had its day too long ago. We entered the lobby with reservations—but not for rooms—to find a large barnlike interior graced with a pot-bellied stove, a few chairs and benches along the walls, a bar in the far corner, and six dogs, who welcomed us. There was also an old fellow sitting by the stove, who after a few minutes looked up at us, but that was all. Aggressively seizing the initiative, we asked him if there was any place in town that would provide us with food and a

night's lodging. He didn't rise to this question with much more enthusiasm than had greeted our entry, but he did manage to tell us, in a roundabout way, "No!" We could stay, he went on, in the Globe Hotel (the building we were now in), but no one had stayed there for many months. The building had been condemned in 1912.

In the end we were conceded permission to take our stove from one rucksack, soup from another, and start an improvised supper. By this time a new character arrived on the scene. He was a grizzled oldster, and turned out to be of Italian extraction; although he had been in this country for about thirty years, Dick and I understood him better when he spoke Italian. Both he and the joint "proprietor" regarded us rather coolly until we happened to mention some of our experiences in Italy, particularly those concerning the days when the mountain troops were in a reserve area near Lucca, the oldster's stamping grounds. The full hospitality of the Globe Hotel was forthwith extended to us. This was to consist of a small room containing an old iron bed and older mattress which the dogs reached first, and a ham-and-egg breakfast of no small proportions. Our experiences in Italy had taught us what we could do with the bed: turn the mattress over and lay sleeping bags on it. Breakfast would be no problem. And an easy hitchhike to our car at Donner Summit would end the delightful two-day tour.

But before the evening was over our first host unbent, and put together more words than we could have suspected he knew.

"Where'd you fellers come from, with them thar snow shoes?"

We told him, in a rough way, but perceived that we were not making much of an impression on him. For a while he settled back into the musings of the grayed and bent. At last he broke his self-imposed silence to announce, "I had a pair o' snow shoes like them, fourteen feet long. That was quite a few y'ars back."

Dick doesn't awe easily, and I couldn't let him outdo me. But it is just possible we both felt a touch of reverence. We had just completed a ski tour, yes. And we had enjoyed it fully—although I haven't dwelt a great deal here on the superb skiing we experienced (along with the bushwhacking, that is). But here, right before us, was a man who could easily have been a contemporary of Snowshoe Thompson, the ski tourer whose fame has lived longest of all. At that, however, touring in his day was far easier. His skis were twice as long as ours. Obviously he only had to go half as far!

SINIOLCHUN HIMALAYA

GREAT MOUNTAINS OF THE WORLD. BY VITTORIO SELLA

Reproduced from display prints in the Frederick H. Morley Memorial Collection of the Sierra Club

K2 FROM BALTORO GLACIER

HIMALAYA

KANGCHENJUNGA

HIMALAYA

MATTERHORN

MATTERHORN

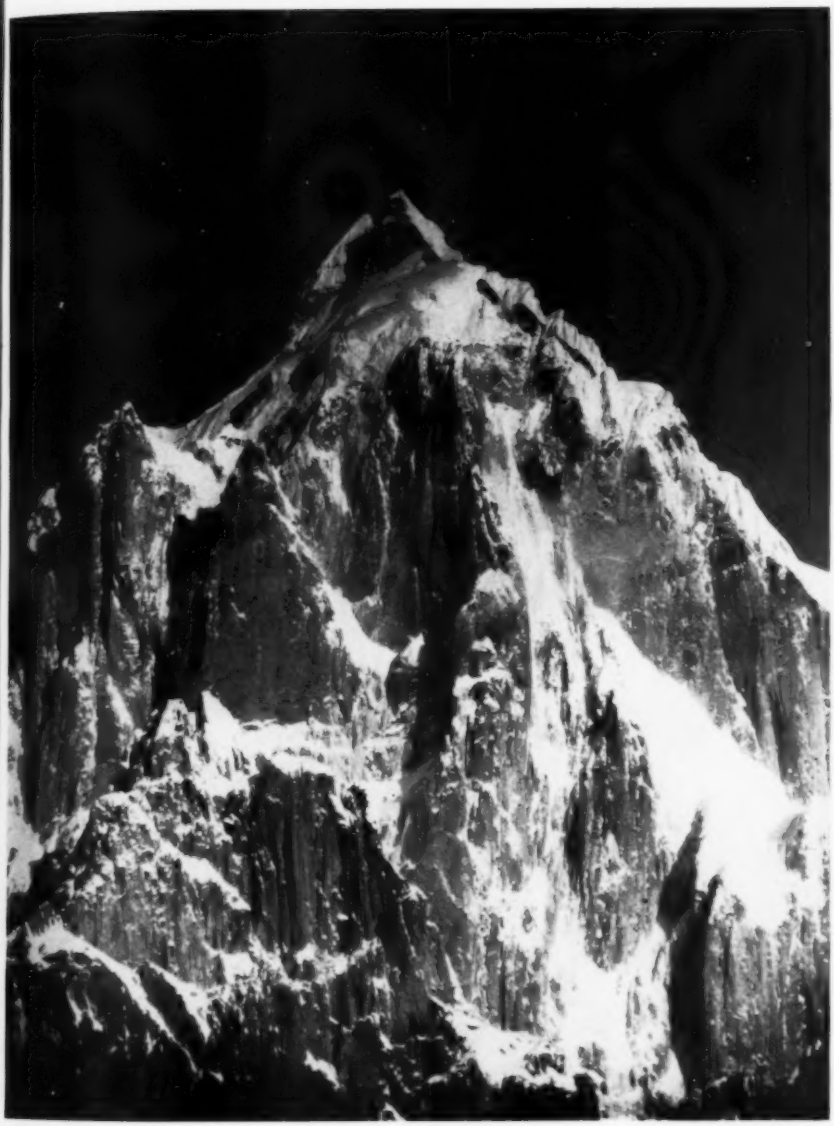
THE MOUNTAINS FROM BALTORO GLACIER

HIMALAYA

UNNAMED PEAK IN THE KARAKORAM

HIMALAYA

PAIJU PEA



PAIJU PEAK

HIMALAYA

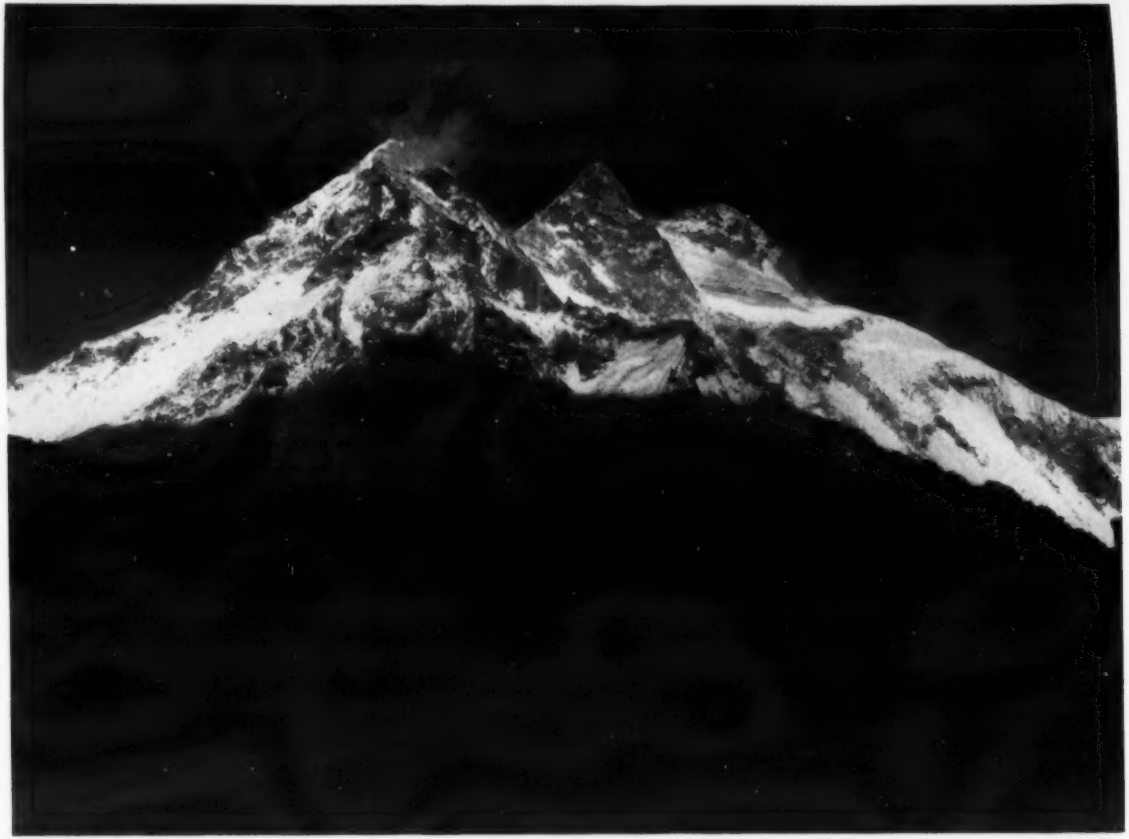
MOUNT BLANC

ALPS

MOUNT STANLEY RUWENZORI, AFRICA

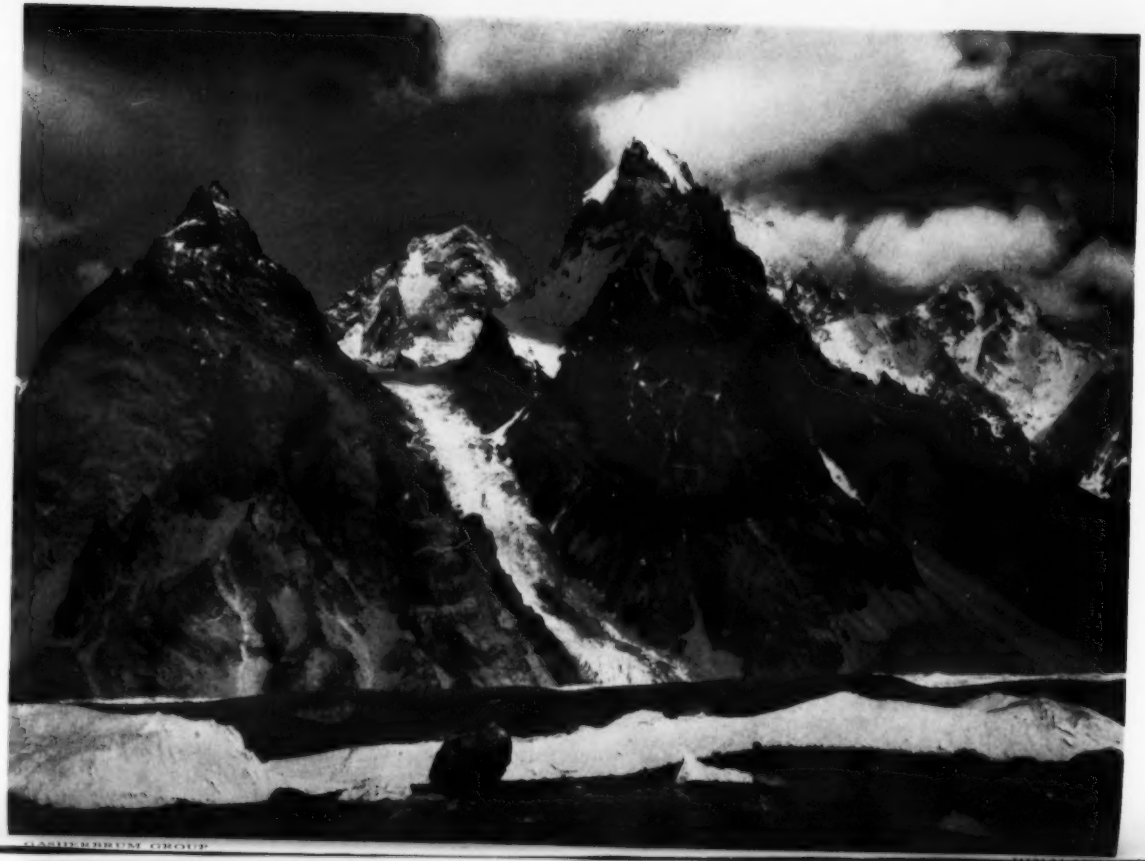
MOUNT STANLEY

RUWENZORI, AFRICA



BROAD PEAK

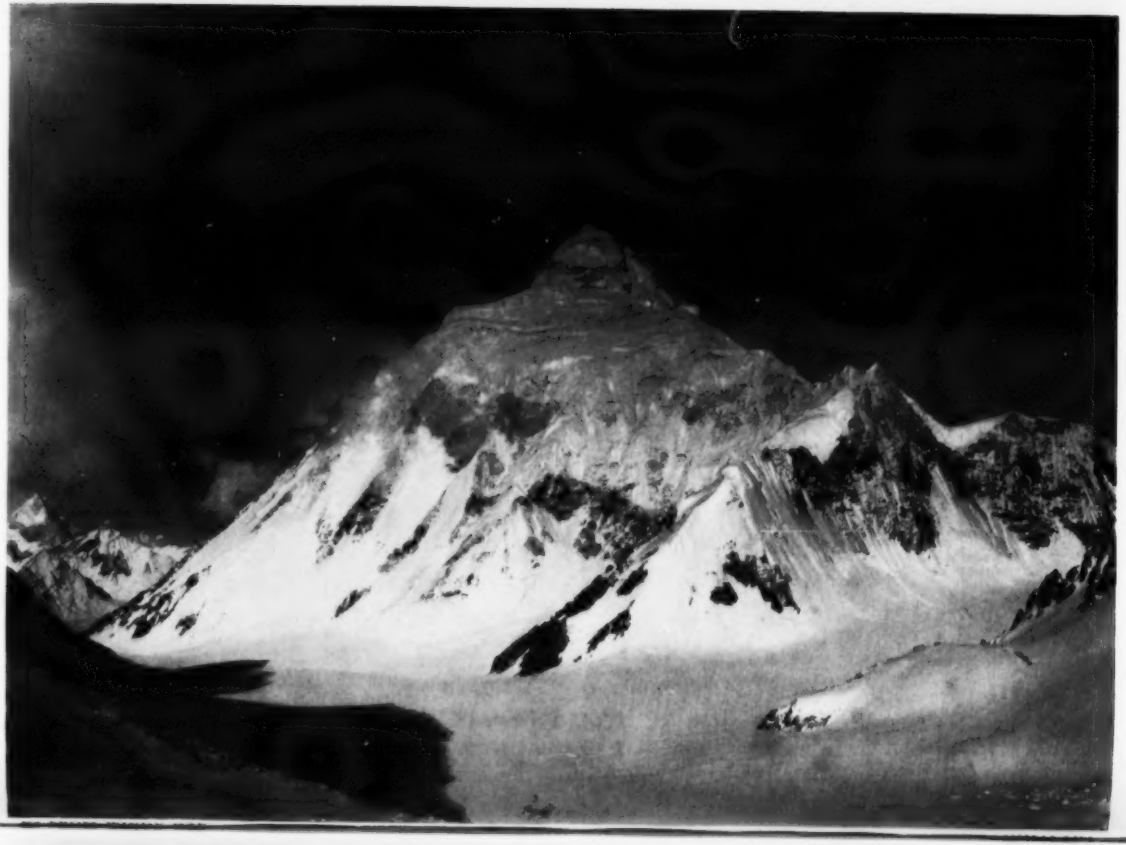
HIMALAYA



GASHERBRUM GROUP

MOUNT PAIJU AND ITS TOWERS

HIMALAYA



DYKHTAU

CAUCASUS

MUSTAGH TOWER

HIMALAYA

Vittorio Sella: His Photography

By ANSEL ADAMS

THE MEMORY OF Vittorio Sella is closely embraced by the moods of the world's great mountains, many of which are known to us chiefly through the beautiful imagery of his lens. Mighty K2, shrouded in the gray plumes of the Monsoon, the thundering avalanches of Mount St. Elias, remote Ruwenzori glittering over the hot plains of Africa, and the noble crag of Ushba towering above the ancient Caucasian lands—these are revealed in all their sheer majesty in Sella's masterful photographs. His was a rich and productive life, and one of the happiest as well. Few have looked upon an equal wealth of the world's splendors, fewer still have enjoyed the opportunity to interpret and express them; and the period of his life encompasses the golden age of mountaineering and exploration. Sella was born in 1859 in Biella, in northern Italy, and died in Rome in 1943. Apart from his photographic accomplishments in the Alps, he was photographer on many important expeditions—to the Caucasus in 1889, 1890, and 1896, to the St. Elias Range in 1897, to the Karakoram and western Himalaya in 1899, 1900, and 1909, and to Ruwenzori, in Africa, in 1906. He was a member of an old and honored Italian family; to quote Freshfield in his Preface to *The Exploration of the Caucasus*, "The nephew of Quintino Sella, the Italian statesman, on the pedestal of whose statue his native town, Biella, has recorded in bronze tablets the two facts, that he added Rome to Italy and that he founded the Italian Alpine Club, Vittorio Sella has inherited his uncle's love of the mountains and the thoroughness he displayed in whatever he undertook."

The average "expeditionary" photography tends toward dullness and the mere factual recording of the scene, but with Sella's sensitive insight and response the magnificence of mountains is clarified and distilled into a high order of expression. For, to a very definite degree, the work of Sella contains the qualities of greatness. We will respond, if not to every photograph, to his work as a whole, with appreciation of the tremendous grandeur of the mountain scene and of his sensitive integrations of majesty and mood.

It is to the lasting splendor of photography that we have had, in

every decade since the time of Hill and Daguerre, great exponents leading in both the creative and functional aspects of the art. No matter how far photography has been led by the Philistines and the Pictorialists from the clean fields of the honest concept and the direct statement, these beacons of expressive and applied photography have maintained a steady and progressive course. Perhaps the most important photography has been that which was directly related to nature, expressed in such clean factual images as those of O'Sullivan, P. H. Emerson, and Atget, and in the poignantly poetic equivalents of Stieglitz, Strand, and Weston. With our many critical evaluations we attempt to segregate and classify and explain, and yet no one has defined the sharp cleavage supposed to exist between the purely functional and the purely expressive in art. In truth, there is no such separation, only a fluid emphasis on one or the other. A photograph of the Canyon de Chelley by O'Sullivan, or of the Golden Throne by Sella, or of Death Valley by Edward Weston, are as concise, factual, and miraculously detailed as could be desired, yet all contain that magical and spiritual potential of vision which transcends analysis.

Knowing the physical pressures of time and energy attendant on ambitious mountain expeditions, we are amazed by the mood of calmness and perfection pervading all of Sella's photographs. The exquisitely right moment of exposure, the awareness of the orientation of camera and sun best to reveal the intricacies of the forms of ice and stone, the unmannered viewpoint—these qualities reveal the reverent and intelligent artist. In Sella's photographs there is no faked grandeur; rather is there understatement, caution, and truthful purpose. The considered compactness of Sella's compositions is typical of good photography; there is no loose sentimentality or emphasis on obvious pictorial patterns. His compositions may appear severe to many, but this severity is actually the effect of accuracy and truth of mood. The icy plume of K2 and the vast thrusting form of the Mustagh Tower are revealed with emphasis on their glorious height and scale, Siniolchum glitters with almost blinding intensity, and the expanse of the great glacier valleys suggests the sheer continental bulk of the Himalaya. In the Caucasus, in the high Alps, at Ruwenzori, and at Mount St. Elias, one feels that Sella has captured the mood and spirit of each region, commanding the qualities of substance, air, and light to perfection.

Referring to the work of the earlier photographers—O'Sullivan in the Southwest, for example—we note a certain stylization of the values of images made with "ordinary" or color-blind plates (sensitive to blue and violet light only). White skies and very deep values representing foliage were typical of these images. Sella's photography was accomplished with orthochromatic plates which are sensitive to all colors of light except those of the red regions of the spectrum. Skies were rendered light gray, and foliage medium gray; atmospheric space was well recorded, and as there was little red in the general subject matter, "panchromatic" materials would have offered slight advantage. Color filters were undoubtedly used to reduce the values of the sky and to bring snow and clouds into vigorous relief. The contemporary photographer will do well to study Sella's craft. He is prone to overdo the panchromatic effect, typified by skies appearing too deep in tone, thereby depreciating the illusion of light, and the loss of atmospheric effects through the use of too-powerful filters. Many of our modern mountain photographs are definitely two-dimensional; planes are blended through elimination of atmospheric values, near and far shadows are rendered in similar tone, and the general aspect is lunar and does not convey the illusion of light and air. Even in Sella's most austere and icy images, one feels space and air intervening, and one is both geometrically and spatially oriented with the subject.

The vastness of the subjects and the purity of Sella's interpretations move the spectator to a definitely religious awe. The step from the purely factual to the inspired interpretation is extremely tenuous; it is impossible to describe in other terms than actual experience of the images what this difference is. It may be traced to an intensity of seeing and a consistent interpretative intention. Photography such as Sella's supports the concept that intuition is the basic creative factor rather than a self-conscious awareness of modes and manners. As in all competent work the excellence of the mechanics is taken for granted; we are not dominated by an impression of technical facility, and none of the photographs have the quality of the *tour de force* so obvious in much contemporary photography.

Sella has brought to us not only the facts and forms of far-off splendors of the world, but the essence of experience which finds a spiritual response in the inner recesses of our mind and heart.

Carbonated Landscape

By JOHN THOMAS HOWELL

LATE in September, 1945, masses of dry cold air accumulated as an atmospheric "high" over the northern part of the Great Basin in Idaho and Utah while at the same time to the south a deficiency of air created a "low" that extended northward and westward from Arizona through California. The cold northern air, reacting to the unequal pressure, poured southward and westward across Nevada: wind whipped to foam the broad expanse of Mono Lake and across the summit ridges of the Sierra Nevada a gale roared beneath a blue cloudless sky. Down the slopes of the range and out to the west across California the air pushed, getting even denser, hotter, drier as the altitude decreased. This is the air that dried to tinder the forests and chaparral of Tamalpais, the air that spread the flames through the heart of the Marin County hills, the air that dusted with ashes the buildings and streets of San Francisco across the Golden Gate.

Within the week the fire was controlled, but not until after it had swept over more than 20,000 acres, a roughly rectangular area extending from upper San Anselmo Creek west to Bolinas Lagoon and from San Geronimo Ridge south to Laurel Dell and the Mountain Theater on the very crest of Mount Tamalpais. So completely was the fire restricted to range and watershed lands that not a single dwelling was lost, although at times the fire threatened Fairfax and other settlements along the northern periphery of the burn. Change of wind did much to check the blaze: the reëstablishment of a dominant North Pacific High and resumption of the cool moisture-laden westerlies quickly counteracted the northeast wind from the Basin and, with the increased humidity, the hazard lessened.

On October 21, three weeks after the fire, I went into the heart of the burned area with a group of Club members from the San Francisco Bay Chapter and in the *Sierra Club Yodeler* of November 5, I described briefly what we saw:

> The desolation was like that which one associates with the desert after prolonged drouth, when even burro bushes look dead and cacti shrivel. The blackened, ashy front of Pine Mountain above

> Lagunitas Canyon resembled nothing so much as some sun-baked canyon side above Death Valley. Lagunitas Canyon was, in its way, a canyon of Death. Along the trail were the charred carcasses of squirrels and deer which failed to escape the flames, and the untold numbers of animals, large and small, furred and feathered, that were entirely consumed cannot be estimated.

My companions who made this trip into the burned area did not share my optimism on the recovery of the vegetation; to them the beauty of the Douglas fir in Lagunitas Canyon and of the manzanitas on Carson Ridge was gone and they could not visualize the return of the plants. But for countless ages the hills and lower mountains of California have been ravaged by fire, and plant communities have evolved which are actually benefited by recurring burns. The brush or chaparral which is so characteristic of the hill country below the forest belt is such a plant association, and quickly following a fire the shrubs again cover the slopes, the new growth coming either from fast-growing seeds or from root and stump sprouts. Annual and perennial herbs also recover rapidly and put forth a special show of vigor and profusion which may result from thermal stimulation but which is more probably due to the fertilizing effect of ash in the soil. In fact some rare herbaceous species are not seen except after burns and it is only in the ashes of their parents that manzanitas and mountain lilacs germinate extensively. Strange but true, the chaparral as a plant community is rejuvenated by fire (a fact that is not appreciated by stockmen who would improve their range land by burning brush).

The destruction of the forest, on the other hand, is to be regretted because its beauty is usually gone for a longer time. The redwood, one of the trees most tenacious of life, is injured by fire but usually not killed, even if entirely denuded of its widely branched and finely leafy crown. From living tissues protected beneath the thick fibrous bark, new growth buds arise and immediately begin to repair the damage. The promptness and speed of this reaction of the redwood was observed in Big Carson Canyon on November 11, just six weeks after the burn, when the charred trunks and limbs were already decked with dense bunches of vivid green shoots.

The great loss in the Marin fire was the fine forest of Douglas fir in Lagunitas Canyon, because, unlike the redwood, the fir is killed by the flashy blaze which destroys its crown but which leaves

the trunk that for years will bear mute testimony to the holocaust. Not only is the death of the trees a loss but the passing of the fir forest is something that only time can repair. Like other highly developed plant communities, the Douglas fir forest is the last of several steps in the recovery of a denuded area; first will come the herbaceous vegetation in which the "fire weeds" of different kinds will be especially numerous; then will follow a shrub formation which, in Marin County, will consist chiefly of poison oak, mountain lilac, and sticky monkey flower; and finally in the shade and protection of these shrubs will germinate the seeds of the firs which, after several decades, will produce again a forest like the one that is gone, the climax plant formation of the region.

In the burned area, there are two other conifers, a pine and cypress, which, oddly enough, should be benefited by the fire. The former is the prickle-cone or bishop pine, one of that small group of pines in which the cones remain attached to the trunk or branches for years and only open to shed their seeds after being roasted. By this remarkable habit the tree is especially fitted to live where fires recur periodically and since many seeds may be shed by a single tree, the density of the forest where they grow may be increased by fire. In the next few years it will be interesting to watch the reëstablishment of the bishop pine on San Geronimo Ridge and to see if a larger number of individuals replaces the relatively few which have grown there heretofore. Prolific reproduction in another species of closed-cone pine has recently been observed on the slopes of Mount St. Helena, where a stand of knobcone pine was killed by fire in August, 1945. In April, 1946, the slope of that mountain was almost carpeted in spots, so numerous were the tiny pine seedlings coming up everywhere beneath their dead parents. Among so many only the "fittest" can possibly survive, but certainly the species in its struggle for existence has admirably and remarkably provided for reproduction under the most adverse condition. Perhaps in like manner the colony of bishop pines on San Geronimo Ridge will be actually benefited by the Marin fire.

The second conifer having a reaction to fire like that of the bishop pine is the Sargent cypress, a picturesque and characteristic feature of the serpentine barrens on Mount Tamalpais and Carson Ridge. In the cypress, as in the pine, the numerous cones generally remain closed and attached to the branches until the tree burns, and

since reproduction following fire is usually abundant, the denuded serpentine areas should soon be re-covered by dense cypress thickets. The youthful cypresses seem to anticipate a recurrence of fire for they frequently bear cones when only three to six feet tall, another of the remarkable adaptations of this plant to a highly specialized condition.

In March, 1946, six months after the fire, I revisited that part of the Carson country where such desolation had been noted the preceding October. After heavy winter rainfall, the vegetation was flourishing, and although it would not be true to say that the scars of the burn were effaced, it was possible to prophesy a normal and rapid recovery for the region. Vigorous sprouts growing from the crowns of shrubs or around the stumps of trees were seen in the following species: California hazel, chinquapin, coast live oak, leather oak, chaparral oak, gold-cup oak, tanbark oak, California laurel, chamise, toyon, service berry, California false locust, chaparral broom, buckeye, California coffeeberry, silk-tassel bush, western azalea, huckleberry, Cushing manzanita, and madroño. Other shrubs were sending up suckers from roots or underground stems: wild rose, chaparral pea, poison oak, yerba santa, and snowberry; while abundant seedlings of chamise, mountain lilac, yerba santa, and manzanita were seen on slopes formerly covered by chaparral.

Among the herbaceous species, the early spring perennials were putting on a fine show, especially on slopes that were formerly wooded. Here were brilliant masses of Indian warrior, azure hound's tongue, yellow snake root, and pale milkmaids. The star lily, at times over four feet tall, was unusually abundant, not only where there had been woods but also brush. So numerous were the many-flowered stalks in places that the plant imparted broad splashes of creamy white to distant fire-swept slopes.

Although the perennial herbs were very fine, the annual herbs which carpeted the slopes and crowned the ridges were the most abundant and colorful. Rose-flowered calandrinias and lavender-flowered phacelias covered steep gravelly slopes between the charred stumps of chamise, while here and there were the brilliant rose-red corollas of a couple of diminutive monkey flowers (*Mimulus Douglasii* and *M. modestus*). At even so early a date about twenty annual herbs were noted, but of all, the finest was a pink-flowered relative of miners lettuce, *Montia exigua*. The densely tufted plants, cov-

ered with numerous flowers, crowded over the gravelly slopes of serpentine outcrops and produced a most beautiful display. Especially effective was the contrast between the bright pink of the montia and the lush green of grassland where the serpentine dipped beneath the sod of meadowy uplands.

That anything good should come from a devastating fire in the California chaparral might seem paradoxical, but even the smoke clouds of the conflagration have a silver lining, be it ever so thin. Apparently certain plants have become specially adapted to grow on burns and although they may occur sporadically and rarely in disturbed soil amid the brush between fires, they frequently come up in vast numbers over broad areas that have been laid waste. Sometimes, as in the case of the montia described above, the flowers may be showy and the display may rival the desert's best; but not infrequently the fire weeds may have an inconspicuous flower, which, however, does not in the least decrease the scientific interest the plants may have for the botanist. On the Marin County burn, *Calandrinia Breweri,* a plant of rare occurrence in the central and southern Coast Ranges, carpeted hundreds of acres; *Silene multinervia,* a choice but weedy-looking catchfly, appeared in numbers after an absence of about thirty years; *Campanula angustiflora,* an inconspicuous and wholly inornate relative of the blue bells, competed for place on rocky knolls; *Phacelia suaveolens,* with foliage smelling like strong honey, graced an ashy flat after an absence of four decades; and *Papaver californicum,* the real California poppy,* the rarest of the rare fire flowers, in all the burned acres traversed was seen only in a restricted gully on the side of Pine Mountain above Little Carson Canyon. These are but a few of the botanical treasures which constitute for the botanist, expert or tyro, that silver lining on the smoke clouds of the brush fire, a lining, I repeat, ever so thin, but there for those who would look for it.

Since only the kiss of the flame is needed to rouse dormant seeds from decades-long sleep, is it not strange that botanists do not turn arsonists on occasion that some floral phoenix might arise from the ashes? Since none is more avid for the new, the rare, or the un-

*We generally think of *Eschscholzia californica* as the California poppy, but both etymologically and botanically *Papaver californicum* is our regional poppy. This plant is similar in structure to the poppies of the Old World which since classic antiquity have been called *mecon* in Greek, and in Latin, *papaver.*

usual among Marin flowers than I, was it not for me the perfect alibi that, on September 27, 1945, the day the fire started, I was far away, struggling to a Sierran summit in the face of that bitter desert gale which a few hours later would fan the flames transforming Marin's cool green wilderness into a scorched and carbonated landscape?

A Week's Bivouac in the Sierra

By THOMAS MORLEY

LAST summer I determined to spend at least a week on a bivouac trip in the Sierra. My plan was to travel without sleeping bag or blanket from Pinecrest on Strawberry Lake to Tuolumne Meadows. Time allowed, seven or eight days; distance, roughly a hundred miles. No friend could be found willing or able to accompany me at the time, so I went alone. I wanted to try several methods of bivouacking: (1) I could bury myself in a huge pile of pine needles; (2) I could heat the ground with a fire, remove the fire, and sleep above the warm spot, so I was told; (3) I might build two fires and sleep between them; (4) I could build a lean-to and a fire in front of it; or (5) I could find a sheltering rock and sleep between it and a fire. As it turned out, I found it practical to use only the last two methods. Not being a John Muir, I knew I could not get any sleep just by crawling under the low branches of a white-bark pine.

For food I planned a typical knapsacker's menu, allowing not quite 1¾ pounds per day, which proved ample. The total weight of food was 13½ pounds. This plus the rest of my equipment brought the total starting weight up to 21 pounds, including a 2-pound camera, a ½-pound hunting knife—foolish luxury—and the 1-pound knapsack itself, as the heaviest single items. I was able to get only one roll of film for the camera. I wore whipcord pants, a light wool shirt, undershirt and shorts, shoes and socks. For extra warmth, I took a light wool sweater, a light poplin parka with hood, and a wool cap.

Thus equipped, I stepped from the bus on the sunny afternoon of Saturday, August 4, at Pinecrest and after brief inquiries was soon on my way up the little mountain road to Crabtree Meadows. The road here makes a long stiff pull of several miles up the end of a great ridge and finally emerges from the fir forest onto the broad rocky ridge top, where the pleasant musk of heavy-leaved Wyethia greets one. Here the road branches, and I chose to continue up the ridge, leaving Crabtree to others. Two or three miles up the ridge the road leaves the crest and ends beside a beautiful mountain stream

at an elevation of about 9000 feet where I stopped for the night. Since there was a convenient thicket of young firs near by, I decided to build a small lean-to. It took two hours to construct this, to gather a half-cord or so of heavy firewood, and to build a small cooking fireplace. No twine or other artificial support was needed for the lean-to; a framework of branches leaned on tripods of more branches served the purpose. Then I had to decide which way the lean-to should face. Since one of the necessities of sleep is a relatively even temperature, and I am naturally cold-blooded, it was essential that the night wind be deflected by some type of shelter. Therefore, I had to guess in daytime the direction of the night wind. Normally, the wind blows up canyon during the day and down at night. Accepting this principle, I never guessed so badly that the situation could not be remedied by chinking one end of the shelter with boughs. A bough bed of some sort was also a necessity, to avoid contact with the cold ground.

The night proved cool but not cold, and I had little difficulty in staying warm as long as the fire burned well. The fire was best placed about four feet from the bough bed. The whole problem, of course, was to find firewood capable of burning a long time, preferably without giving out too great an initial heat. As a rule, the bigger the better, and some monstrous logs contributed to the cause. I found that the most sleep to be hoped for at one time was about two hours; then the fire had to be rebuilt.

I also learned, as the trip went on, that it was a good idea to save one of the largest logs for the time when my metabolism began to drop rapidly. This log I called my "two o'clock special." The effort required to stoke the fire was usually just enough to dispel my drowsiness, and some time was always lost before I could get to sleep again. Thus the night passed, warm enough but not really comfortable. The total amount of actual sleep gained in any one night was difficult to estimate but probably did not exceed six hours. This seemed to be enough, spread out as it was over eight hours or so. I felt well and was never aware of lack of sleep.

One good thing about bivouacking is that there is seldom any difficulty in getting an early start. The next day I arose at 5:30 A.M. and was off by 7:00, the golden sunlight striking halfway down the tall firs. As I crossed the meadow the air was still heavy with the cool moist breath of night. Soon the purling of the stream

was faint in the distance. Along a granite ridge to the southeast the trail led, getting fainter and fainter except where cattle used it. I had experienced some difficulty in obtaining an up-to-date map of the region, and had finally been forced to make some corrections and additions to a standard topographic map of Yosemite National Park. These alterations I took from a revised Stanislaus National Forest topographic map, not yet available to the public, which I was able to borrow from a friend. Now it was disconcerting to learn that both contours and trails were badly in need of correction; they were so far out as to be useless in some places. Soon the trail disappeared completely, and I lost an hour floundering down into a granite-ribbed canyon and out again before finally locating myself. This was the poorest section of trail encountered on the whole trip and, fortunately, the only time I had any real trouble.

Once more on my way, I soon reached Upper Relief Valley; then came a long stretch of choppy granite country to Deer Lake where it was time for lunch and a bath for tired feet. That afternoon I went past beautiful Buck Lake and then Cow Meadows, and at last arrived at Huckleberry Lake, deep in Cherry Creek Canyon. It was time to camp.

The afternoon had been cloudy much of the time, and now a few drops of rain started to fall. This would never do. Heroically turning down an offer of hospitality from a party of fishermen, I walked slowly up the canyon, searching for some type of shelter. No caves; no overhanging rocks; no big down logs facing in the right direction. It was raining harder now. Finally I came upon a large stump about ten feet high. The bark had all fallen off, and the center was completely rotten, leaving a thin periphery the only solid part. This had begun to split lengthwise into wide boards which fell to the ground. I assisted the process and used these crude rounded boards as the roof of a lean-to, overlapping the edges to make a rude clapboard job. Then I chinked the gaps, built a bough bed, collected wood, and made a fireplace. The rain lasted an hour or so and then stopped, needless to say, shortly after the shelter was completed. This night added little to the experience of the previous one. I slept fairly well, arose, and departed before the sun reached the depths of the canyon.

Now the trail led up the mosquito-infested gorge to Horse Meadows, sparkling with white racemes of an alpine *Polygonum*, and on

beyond to Bond Pass. Approaching Bond Pass I traversed one of the largest forest associations of mountain hemlock in the Sierra. And just beyond this—joy of joys—is an exquisite mountain meadow, perfectly set just below the pass with dark hemlocks on three sides, drenching wet from the stream flowing through it, and its rich green lightly veiled by the delicate rose of thousands of fragile alpine flowers.

Bond Pass marks the boundary line of Yosemite National Park, and this brings with it two matters of interest to the hiker. Within the park the trails are better and are better marked, and the contour map becomes at once much more accurate. Secondly, there are no more cattle. To me, cattle in the mountains are a plague. You never feel safe about the river water, although you drink it anyway; and the nicest bit of grassy shade by the mountain meadow, just where you want to stop for lunch, is certain to be occupied either by an enormous red steer or his trademark.

From the pass the path drops down into the upper end of Jack Main Canyon. Here once more it rained lightly for half an hour or so; I walked through it and lunched when it stopped. In the afternoon I traveled down the canyon. The head of Jack Main is a beautiful, flower-strewn, parklike meadow with a meandering stream, much resembling Tuolumne Meadows in places. Farther down it becomes steeper and more rugged. Here the trail from Tilden Lake joins the canyon trail, and here therefore I turned, crossed the river, and began climbing. Two full grown bucks, resting quietly in the forest, neither saw nor heard me till I whistled at them, thirty yards away.

At sundown, the vast tranquil silence of Tilden Lake and its beautiful setting were deeply impressive. What loneliness the immense solitude aroused was overcome by my delight in the scene. The logical campsite was on a point overlooking the lake near its lower end. Here a new situation faced me: at this altitude there were none of the fir thickets so convenient for thatching lean-tos. However, there were several nearly vertical rock faces in sheltering positions, and at the foot of one of these I laid a thin bough bed, scantily plucked from some distant hemlocks. Wood had to be carried 150 yards. That night for the first time there was a very heavy dew, and the bough bed was wet by the time I lay down on it. The portion of my body turned uppermost was always wet,

and had to be dried at intervals by rolling over. In spite of this, I was never cold and managed a reasonable amount of sleep, thanks to a good fire.

Next day proved rough but interesting. Up 700 feet over Macomb Ridge and down again into the wild and rugged gorge of Stubblefield Canyon went the trail and I; then up once more, climbing in the bed of a rushing mountain torrent, shoulder deep in fragrant ferns, columbine, and monkshood; then down yet again into Kerrick Canyon for lunch on a great boulder beside the river. In the afternoon I trudged up Kerrick Canyon through flower beds and deep masses of pungent Labrador Tea to Seavey Pass where once more it rained a short while—the last rain of the trip. After capturing and releasing two mountain quail chicks, to the great concern of their mother, I dropped down under Piute Mountain to Benson Lake.

Here camping was a problem, for the beautiful beach area was all too exposed. I found a small sheltering ledge across the river from the southeast end of the beach and set up camp much as the night before. A naive young doe, surprised to find her favorite ford blocked by my camp, spent half an hour poking suspiciously through the surrounding willows on different approaches. At last she gave up and crossed with a huge splash farther downstream. The night passed moderately well, although the ground sloped so that the bough bed could not be placed immediately at the base of the sheltering rock, and at times the night breeze flowed gently over me, reducing my ardor for bivouacking.

It was with reluctance that I dragged myself away from the still lake and sunlit beach for a late start. I reached Benson Pass by noon, however, and stopped just beyond for lunch beside a small stream. At this point my plans called for a side-trip to Burro Pass if time was available, and time was. Chewing a last dried banana, I struck out cross-country for Shamrock Lake. Once there was a trail here, but now all has disappeared except a few ducks, scattered at long intervals. Little Shamrock was swarming with thousands of large black tadpoles. On past Tallulah Lake led the route and down into one of the most enchanting little hanging valleys I have ever seen—that of Camp Creek—and it was indeed a perfect campsite from one end to the other. But it was only midafternoon, and I continued on to the grassy floor of Slide Canyon. A

short distance up the canyon was an ideal spot for the night: a sheltering rock ledge near the river and several old stumps for fuel. For boughs there were five or six young mountain pines and hemlocks which had been torn from their roots high on the mountainside and hurled to the bottom of the canyon by a winter avalanche.

Next morning, Thursday, I journeyed up the valley past the tremendous boulder slide from which the canyon derives its name. Then I traveled on to the Burro Pass trail, and up this through a series of small meadows to Burro Pass for lunch. It was still impassable to animals. From here it was an easy trip down the long Matterhorn Canyon, up the steep south ridge to Miller Lake, and down again to Spiller Creek, where I camped.

On a large flat island of polished granite encircled by the river I found a big overhanging glacial erratic for shelter, and also a great quantity of heavy driftwood. Soon dinner was finished, and I built up the fire for the night. The wild sounds of the wind in the pines and the near-by rushing waters were depressing. The solo traveler's tendency toward loneliness is aggravated by the stop at nightfall. There is no longer something new and distracting to be seen around each turn; the sun is gone. There remains only the blazing fire to divert his mind from that disturbing sense of insecurity aroused by the vast unfeeling emptiness of the surrounding wilderness. Against such thoughts the fire battles bravely.

Another function of the fire is to enable the large black ants to add a swing and graveyard shift to their normal work day. Those within the circle of firelight never know when to quit, and at this campsite were especially annoying, continually mistaking my pants leg or shirt sleeve for their rock-cranny home. I slept fairly well, however, and was ready to go by 7:30 next morning.

On the way to Virginia Canyon I surprised a large golden eagle ten feet distant on the ground tearing at a small marmot. He flew off immediately, as startled as I was. Instead of following the Cold Canyon trail down to Tuolumne Meadows, I cut off on the knapsack route to Young Lake shown in the Starr Guide. Never again. This route is on a steep side hill in a deep forest full of down logs and thickets most of the way, and is confusingly marked at first and then not at all. Approaching Young Lake, I began to notice signs of human beings. First there were a few footprints, then hundreds, then an orange on the ground, then perfumed talcum

powder; and I knew that here indeed was the threshold of civilization. Soon I was talking to the first people I had seen or heard since the Huckleberry Lake fishermen. Chance had led me to the group of Young Lake campers under the leadership of Oliver Kehrlein.

Once more I was kindly offered hospitality, in the form of horse blankets and tarpaulins, and once more I declined in order to round out a full seven nights of bivouacking. I did not refuse the invitation to dinner. The afternoon I passed preparing the night's stand beside a large rock. This night the temperature dropped below freezing for the first time, but did not appreciably affect my comfort.

Saturday morning, after overhearing various inexplicable reports about some strange person who kept a huge bonfire burning all night, I got off to a late start up Mount Conness. I reached the top in an hour and three quarters and took in the view for some time. Then in an hour I was back at Young Lake for lunch. Afterward I dropped down past Dog Lake to Tuolumne Meadows and Parsons Lodge. What a welcome relief to sleep in blankets once more!

The trip was well worth while, but I don't want to repeat it. On a long trip, the advantages of this type of travel do not offset the disadvantages. A bivouacker must find wood in abundance, water and shelter, all near each other. Wood must be near by for sake of transport; water must be near in order to put out the night's fire with a minimum of effort. Finding such a place is not always easy, and the bivouacker may find himself scurrying over the landscape in desperate search while the sun goes down. This breeds a certain anxiety which weighs heavily on the mind from about 3:30 P.M. on.

Gathering wood and boughs and arranging a shelter is hard work and takes time. It would be easier to stay more than one night at a camp if there were enough wood. One person does not get a proper amount of rest. For two or more people, the work of preparation would be reduced, and they could take turns rebuilding the fire at night. On the other hand, a rock shelter suitable for two or more is difficult to find.

I had hoped to test more of the different bivouac methods than I succeeded in doing. The altitude was always too great for yellow pines, which best produce the deep needle masses needed for cov-

ering oneself. Often there were not even firs for thatching. Never did I make camp soon enough to allow time for heating the ground with a fire in order to sleep there, nor does this strike me as a very satisfactory method, since there would be no heat whatever above. And when it comes to sleeping between two fires, the problem of a wood supply is raised and also that of shelter from wind.

Thus the journey was only a partial success from a bivouacker's standpoint. From another point of view, it was entirely successful. I had many new and interesting experiences and found out what I wanted to know: that such a trip is done readily enough, but is not practical. My hopes are not completely destroyed. Someone may yet devise a comfortable means of bivouacking.

Pursuit in the Alps

By DAVID R. BROWER

OUR first view of the Lake of Garda and the Alps around it came on the cold, stormy dawn of April 28, 1945, when our battalion of Mountain Troops first touched its 100-mile shoreline. Through a drenching, all-night rain the 87th and 85th Mountain Infantries had taken turns pursuing the fleeing Wehrmacht up the east shore from the Po Valley, and just before dawn the 86th passed through the forward elements of the 85th at a small group of resort-like villas known as Navene. Our eight-hour shift in the lead was coming up. At least it was supposed to be eight hours.

At Navene we found that the shoreline of Italy's largest lake was beginning to get rugged; gray granite cliffs and steep brushy slopes dropped sharply to the black, very deep, rough water, and rose more than seven thousand feet to the snow-covered bordering peaks. Along the east shore it became increasingly difficult for a highway to cling to the mountainside. About a mile north of the town was the first of a series of seven tunnels which led through the rocky buttresses to Torbole and Riva, larger towns at the north end of the lake. The first of those tunnels was now demolished, at least at its entrance, for the Germans had effectively halted the progress of the 85th by blasting the tunnel, as well as some minor bridges that led toward it.

Preparatory to following the 86th's 2d Battalion, the 3d Battalion moved off the road and dispersed. Artillery and tanks moved up into position to fire on the enemy across the lake. The Battalion CP was set up for the moment in a villa that had, until a day or two before, housed high German antiaircraft officers. It still housed—but not for long—a large hero-worshippers' portrait of Hitler. From the beach around the villa point we could have enjoyed our first close-up of the Alps, stormy though it was; but German shells began to whoosh over the point, to kick up fountains of water just beyond its far side. When our counterbattery fire put an end to this, we could still not settle down to enjoy either the villa or the scene.

The situation was not a happy one. We were committed to attack along Garda's east shore, where the ruggedness of the terrain mul-

tiplied the strength of each defending enemy soldier by ten. The highway, our main avenue of approach, was entirely too much an avenue for enemy defensive fires and demolitions. Word came down to the battalion that higher headquarters were considering a flanking action to the right of the highway. A trail led from Malcesine almost to the summit of the high escarpment east of the lake, then worked north, up and down, along the slopes of the ridge to a point above Torbole, at the head of the lake.

Wasn't this situation just what we were asking for? Hadn't we, as mountain troops, been trained and equipped for just such terrain? Shouldn't we be able to effect complete surprise by attacking along a route that the enemy—especially a disorganized enemy, few in number—would have to assume could defend itself? There were some who would answer yes to all these questions. But there were more who would answer no. Ironically, I remembered the training years that had gone before. At Camp Hale, and in West Virginia, in orientation lectures in which we tried to point out to mountain-troop and flatland GIs why we were giving them mountain training, one of my standard examples had been this: as the fighting in Italy moves northward, men are going to be needed for invasion routes across the Alps, or at least for flank protection when the Allied armies do a column right or column left to by-pass the Alps. Some big gear in Washington will thumb through the files and say, "Ah ha! The Tenth (or the 28th, the 45th, 35th, 77th, or 95th) Division has been at Camp Hale (or West Virginia). They know all about mountain fighting. We'll use them." We could all laugh easily at that purported humor. We realized, first, how little we knew about mountains and how sadly unprepared we would be, after a hardly more than faltering mountain-training program in lesser American mountains, for the ever so much more thoroughly mountain-trained Germans fighting in the ever so much more rugged Alps. And in the second place, we were sure that the big gears knew of our shortcomings, and that such a horrible predicament could never happen to us.

So here we were, mountain troops, fighting in the Alps at last. But where was our mountain equipment? Presumably, it was back in Naples. Higher echelons weren't interested in mountain equipment, anyway. The equipment and clothing with us was no different from the ordinary flatland GI's equipment, right down to the last

shred of underwear—except that even most of the flatland apparel had been left behind when we jumped off, and we hadn't had so much as a change of underwear for about a month and a half. Ropes, mountain boots, sleeping bags? Why ask about those? We hadn't yet captured enough German blankets to give more than one man in ten a blanket to his name. The Tenth Mountain was less well equipped for mountains than were the flatland men who had suffered so many needless casualties from weather and terrain on Attu! Yet the Alpine weather and snows above Lake Garda could be fully as severe.

How about the time element? Hastily calculating from my own mountain experience, I estimated that in good weather, with no snow on the trail, one man, who knew a little about mountains and was properly dressed for them but otherwise climbing free of load, could have covered the high route to Torbole in about 17 hours. How would a battalion fare? The weather was not at all good; an unknown amount of snow covered the upper slopes. We may have had many men who knew a little about mountains when we hit Italy, but the Division's 4,000 casualties had included too many of the original mountain men. We utterly lacked proper clothing and equipment. A battalion column would be four miles long, hard to control, and flank protection for the column would be all but forbidden by the steepness of the slopes on either side of the trail. Without mules, we could hardly hope to secure such close artillery support as might be necessary. And finally, far from being free of loads, the men would have to carry weapons and ammunition. That would be bad enough for riflemen. Heavy weapons men would have tougher sledding still.

The road and the right flank were out. The left-flank route remained—the choppy waters of Garda, breaking against the lakeshore cliffs beneath the highway, fully exposed to all artillery fire the enemy could bring to bear. It must have been a difficult decision to make; it was certainly an unprecedented decision: the 10th Mountain Division would conduct an amphibious operation in the Alps!

Just about at this time, an ironical, terrible smirk crept over the face of fate with a capital *F*. A few hundred miles south of us, the highest echelons, seated in the comfortable splendor of the royal summer palace at Caserta, had fixed their names to the papers terminating German resistance in Italy and southern Austria. But at Lake

Garda neither we nor the Germans knew it. The speed of our advance had been just about as hard on our own communications as it had been on theirs.

Perhaps more through fortune than foresight, a covey or flight of "ducks" (amphibious trucks), attached to the Division at the time of the Po crossing, was still with us, having been used to augment six by sixes in the motor march to Lake Garda; the ducks would have enough freeboard for the choppy lake water. So Malcesine became a POE for the men of the 2d Battalion. They boarded the ducks, which thereupon headed up the lake to by-pass the demolished tunnels, staying close to the shore for what protection it might afford. No sooner had the flight of ducks become a fleet than the Germans replied with their only defense—antiaircraft artillery. Garda had been a hot spot for Allied airmen who flew bombing runs across the Alps, and the 88s which had harassed them were now depressed to blast the ducks out of the water. They cut loose from their positions in Riva and Torbole, with time fire that burst in angry black flak puffs over the ducks, and with point-detonation shells which shot geysers high in the air above the ducks and their burden of mountaineers. Some shells blasted the cliffs above the fleet, and falling rocks were added to the flying fragments. The ducks moved farther offshore. The firing gained in intensity.

To those of us back at Malcesine who watched the scene, swearing at the Krauts, sweating out the 2d Battalion men as they moved steadily on through falling rock, flak, and geysers, straining to pick out enemy gun positions as counterbattery targets, it seemed as if the 10th Mountain's first amphibious attack could only be annihilated. Men couldn't live out there. Then the word came back that there had been no casualties—and that it was our turn. Not daring to expect such amazing luck, we took off, some 25 men to each bobbing target. Our first ducks were untouched, but later loads were less fortunate.

By-passing the first two tunnels, as had the 2d Battalion, we landed on a tiny beach in a cove, scrambled up the steep slope to the highway, and moved into the shelter of the third tunnel, which was free of demolitions. Meanwhile, the 2d Battalion had moved up the road nearly a mile and had set up a defensive position for the night. Under cover of darkness we passed through their position and set up our own well beyond it. Here the slope to the east was less

severe, and although traversing it would not be easy, we welcomed the opportunity to deploy the battalion. Companies I and K would make the traverse; L Company would continue along the highway.

Whatever remnant of the night had been left for sleep was made as uncomfortable as possible by the continuing light drizzle. But a dark, cloudy, drizzly night on a steep, slippery, and rocky mountainside was luxury compared to what was coming up.

Now the weather cleared. Observation was excellent—altogether too much of an advantage to the defending forces. The delay along the road which had been brought about by expert German demolition work gave the enemy a chance to organize his defense. But time had worked against us. Lack of sleep was beginning to show. Because of the rain, a late start, and the irregular motion of the trucks, the men had not slept too well during the move from Bussolengo, in the Po Valley. Most of the following night they had been moving toward the forward defensive position, digging in to improve that position, and getting ready to move out for the dawn attack. In fact, none of the men had enjoyed a full night's sleep since the Po River was crossed, and that had been the only good night since the final push began in the Apennines, fifteen long, demanding days from this spot on Garda's shore. Nor had there been time to eat properly. The men were worn.

But the attack continued. L Company men moved ahead through another tunnel, short and free of demolitions. But they couldn't get out of it. The north end was covered by machine-gun fire from an embrasure carved out of the solid granite just to one side of the entrance to the next tunnel. M Company men moved up a 50-caliber machine gun to seal off the embrasure with far more deadly fire than it could return. Under this cover, riflemen spurted forward, tossed grenades through the doorway in the wall of the next tunnel which connected with the embrasure room. Two of its occupants staggered out into the tunnel to die; another six lay where they were. The tunnel was ours, and the advance elements of L Company moved quickly through the black interior, to stumble over a pile of debris in the far end.

This was the Tunnel of the Dead, and Death had not left it. The first American troops to reach the far end had already seen too much horror to absorb any of the horror that met them there. Possibly it pleased them at the time. The debris was not all inorganic; it was a

shambles. Apparently a rear-guard crew of about twenty Germans —it was not now possible to discern exactly how many—had been hand-moving a 20-mm. antiaircraft gun to a new defensive position to their rear, where they could keep it depressed and continue to fire on infantry, not aircraft. The gun carrier was loaded with ammunition. Somehow they ran afoul of their own demolitions, likewise intended for us. Their war ended quickly, if not prettily. The explosion set fire to their own ammunition and to them. Pieces of men were scattered as far as fifty feet out of the tunnel. Part of the massive rock roof of the tunnel collapsed and fell to the floor, but there was too little rock to complete the burial or to extinguish the smoldering.

The L Company men moved forward over the debris, on toward the seventh—and last—tunnel, which curved, its far end being lined up directly on Torbole. The Germans did not intend to have L Company get out of this one, either, and fired machine-gun and pom-pom (20-mm. antiaircraft bursting shells) fire into their end of it. Too many ricochets reached for our end, and L Company stopped.

The heavy weapons company men moved to the debris-filled mouth of tunnel no. 6 to plan what relief they could for L Company. Major Bill Drake, now our Battalion Commander (Lt. Col. Hay was Regimental Executive Officer at this point), was there. With him was Major John Seamans, now 2d Battalion Commander, reconnoitering for a relief of our Battalion. To complete the battalion staff representation, the tunnel-end party included Lt. Jim Church, M Company Commander, Captain Barrett Ely, H Company CO, Lt. Ernie Field, 3d Battalion S-3, and Lt. Doug Butterwick, the Battalion's antitank officer. Then there was the artillery forward observer, and Regular Army Sergeant Davis, one of the best machine-gun men in the business, plus about half of M Company. Some of the men were in the tunnel. Others were spread out in front. Suddenly, a few 88 airbursts rent the air overhead and drove all the men into the tunnel for protection.

The Battalion CP, where I was at the moment, was quite comfortably situated behind tunnel no. 5 at the only point near by from which radio contact could be had with the traversing companies and L Company. It was sunny, shrubs and annuals around us were showing their springtime greenery, and a few men went down to the

lake to fill their canteens with mountain water. An ominous message came back from the Battalion Commander's radio operator.

"Send up all the litter teams you can get!"

Captain Ev Bailey, now the Battalion Executive officer, relayed the message to the Aid Station, farther back along the road.

Soldiers don't pale easily. But Lt. Butterwick, who came running back to our CP about then, was pale. A piece of shell fragment an inch across had ripped into, but had not entered, the top of his steel helmet, and was still embedded there, although he didn't know it.

"Major Drake's been hit," he said to Bailey, "and wants you to take over. They got a direct hit inside the tunnel."

The details came later. The airbursts had driven everyone into the tunnel. Then a one-in-a-thousand shot hit the jackpot, and burst some fifty feet inside the tunnel. Those who were not hit with shell fragments or rock splinters were at least temporarily stunned or deafened. Some thought that another demolitions charge had gone off inside the tunnel. Others thought that an airburst had detonated in midair between the tunnel walls. Before the smoke and dust cleared there was the terrible sound of many moans. Men in agony screamed "Medic! Medic!"—words which were often last words. It was a long time before the medics and litter teams arrived to salvage the living. The final toll was seven dead, forty-four wounded. For one shell.

It was imperative to get some of the injured men back to complete medical aid as soon as possible. With help from the walking wounded, the litter teams moved them to comparative safety behind a buttress some distance back along the road. But engineers had not yet been able to repair the demolished road to Malcesine, and the remaining route of evacuation had to be by water. As one man in the battalion, Pfc. Ross, wrote, "The Germans had the water beyond the protecting rock ridge registered in and it was only with great difficulty that ducks could move in and out with ammo and supplies Consequently, fast assault boats, powered with outboard motors, were called up. They were just large enough to hold two litters and the one-man crew, and were manned by an engineer outfit that did a superb job in keeping the old motors going as the small craft bounced from wave to wave. Several of them stalled, but the engineers always managed to get them started again before enemy artillery could zero in."

Devastating though the shell in the tunnel had been, the attack went on. By that night companies I and K relieved the pressure on the far end of the last tunnel, and L Company fought its way into town. The Battalion CP was set up among the German corpses in tunnel no. 6, and experienced great difficulty in maintaining communications. Only radio was available, and although well outside the tunnel, it was too well shielded by cliffs. Artillery men hand-moved their pack 75s into the tunnel, but had no targets to fire on. The will to attack seemed to be disintegrating into a stupor. In the rear echelons of the Battalion the third sleepless night was beginning to tell. However, adrenalin distilled in fear was meanwhile keeping the forward elements well awake.

Excerpts from some of the front-line riflemen's accounts show that a staggering sort of progress survived that day's pandemonium. Staff Sergeant Dick Emerson, 3d platoon guide for Company I, was a cool observer and participant in what turned out to be I Company's only fiasco:

> Early in the morning the men were wakened and the advance was continued (without time for eating). The day was off to a bad start. We moved in a long traverse of the mountain wall above the lake, on trail part of the time, but mostly in the tall thick brush. The pace was moderate, but the going was rough, what with the heavy loads of ammo and weapons. Finally, around noon, I Company, rounding the shoulder of the mountain, looked down on Torbole and called a halt.
>
> Up to this time very few I Company men knew the scheduled plan of attack, including many of the NCOs. I Company was to lead off, with K in reserve. Our position on the hill was excellent for observation and cover. Lt. Elufson, the acting company commander, and the four platoon leaders, with NCOs, observed and chose the likely route. It entered the town from above and behind, through a corridor of olive trees with a rock wall on either side. (Both these rock walls, it was found later, were well fortified.)
>
> Leading down the mountainside diagonally toward the town was a trail. The second platoon led off single file. The third, then the first, and finally the weapons platoons followed. As soon as the second platoon started down, it was fired on by long-range sniper fire. Immediately the platoon leader radioed back, "We're pinned down by sniper fire." Only two shots had been fired! Ma-

chine-gun sections were moved up to give covering fire. They opened up, spraying likely positions below—but the company didn't advance. T/Sgt. Staley was given command of the second platoon. Again the covering fire started and the second and third platoons moved down the slope. Snipers picked at each man as he displaced forward. Generally the shots missed by a good six feet.

By this time the sun was getting low. Radio contact with the second platoon was lost, so Lt. Rivers, of the third, went down with his radio man to regain contact and find out what the trouble was. The radio man was hit on the way. About then the Jerries were seen to drag up a howitzer some 1500 yards away and drop shells directly on the trail, inflicting casualties with each shell. Word was sent for the knee mortar to be brought up as a counter. The weapons platoon lieutenant had no knee mortar, so he sent the three mortar crews down the trail, mortars and all. Several were hit by the sniper because they presented too slow a target with their burdens. The mortars were never used.

An order then came to withdraw. The second platoon was already down the mountain, and the third almost. The second was in a good covered position and would have suffered coming back up, but could not advance alone. The third was brought back up to help the first as support for K Company, which was now going to by-pass I Company on a more direct route down. The second platoon was left where it was, with Lt. Rivers and a machine-gun section. They were not to move until dawn.

Back on top again, Lt. Walucz took over the third platoon and I Company moved down behind K. Throughout the day I Company had plenty of spirit, but severely lacked leadership.

Before dawn this Battalion of mountain troops was to have run the gamut of infantry fighting. Already they had patrolled in camouflage whites and on skis in the Apennine snows, had fought their way down out of the Apennines while being supplied by mule, had walked through Po Valley farmlands, been cheered by liberated Italians, had ridden in motorized task force columns, had been strafed, had crossed a river in assault boats, captured a city, in the Alps had gone amphibious and now had about accomplished a flanking action on a steep mountain slope. But they had not yet tangled with tanks. Staff Sergeant Faulkner, who was with the company now about to lead, describes the renewed attack:

Finally the word came back that K Company was to go down the mountainside to take Torbole. Meanwhile the good old air corps was giving Jerry a hard time by dropping bombs and strafing, which enabled us to go down the slope undetected and without taking any casualties. We then had to cross a large, barren, rock-studded plateau in order to enter the outskirts of town. Three snipers spotted us, and they, plus two men with burp guns, pinned us down. By rushing from rock to rock we made it to a grove of trees and there organized our next plan of attack.

S/Sgt. Holbrook of the first squad in the third platoon nearly jumped into a foxhole with a Jerry, but he spotted him in time. It was from this Jerry that we got our information about what was in Torbole. He told us that there were three tanks in town and about eighty men from different outfits. We sent him back to the rear and started down the rest of the way into town.

By this time it was dark; we had lost contact with the second platoon and most of the weapons platoon. We cleared out the first house we came to, which was used as a Company CP and aid station. From this house the first platoon started into town and the third followed. We spotted eight men coming down the road from the tunnel and withheld our fire, thinking it might be L Company. Too late we discovered they were Jerries, and opened fire, which they returned. Again the 20-mm. fire from the ridge we were to take opened up on us again. Jerry knew that we had gotten into town then and really let loose with all he had. A 20-mm. antiaircraft gun was holding the first platoon up in the village square, so Sgt. Smith, of our weapons platoon, set up a machine gun and had his men fire it at the 20-mm. gun by reaching around the corner and flipping the trigger, spraying lead in the general direction of the 20-mm. This enabled the bazooka team to get close enough to knock it out.

With the 20-mm. knocked out we split up the town, with the first taking the right half, the third the left. We then searched the buildings in the dark, mostly by pawing around with our hands in all the houses. About halfway through town the first platoon came across an enemy squad and got into a small-fire fight.

Part of the town was burning, so it enabled us to watch the streets more easily. All at once we heard a clatter of tanks and

several loud reports. Everyone began to head for the hospital, a large building down by the lake's shore; but the two lieutenants got together and decided we could stop a counterattack more easily in the village square. So everyone took off like a herd of turtles to the village square.

L Company, elements of which had now reached town, helped us set up a defense from the water's edge to the far side of the square. M Company finally showed up with the machine guns and everything got under control. Except for one thing—we had very little ammo left and no artillery support. We were all out of antitank grenades and bazooka rounds and even had to give some of the riflemen's ammo to the machine gunners to load into belts

The Jerry tanks, Mark IVs, rambled up and fired at different buildings, and their foot troops spread out and protected the tanks, which would fire for a while and then move forward some more. The village square was pretty well protected by buildings in front of it, so the tanks had a hard time getting direct hits. But when they did, they really scored, because of our crowded condition in the different houses. We had two men at each window in each house, and everyone was on his toes and alert.

The counterattack started about ten at night and lasted until 4:30 next morning. It was pretty nerve-racking in those buildings, where you never knew where one of those tanks would roll around a corner and open up on the building you were in. (Oh. While we were searching the town a Jerry plane came over and bombed the mountainside we had come along after dark. I heard that the 1st Battalion really caught hell from those bombs; they were up there on their way to Nago.)

The 1st Battalion did have trouble, but finally took Nago. Meanwhile, however, neither K Company nor the 3d Battalion were through yet. Another man from K Company, overlapping Faulkner's account slightly, tells the rest of the story:

Just as Sgt. Belgea came up to see about setting up his other two machine guns and began to give his orders, two tanks, up the road about 75 yards, began to fire on the buildings we were in. Until now everyone had been merely standing around; now they raced upstairs and took up firing positions in the windows. The two tanks came steadily down the road, firing as they came. Of course, they didn't know which buildings we were in; neverthe-

less, it was very disconcerting to sit there waiting for them with nothing but bazookas for defense. Our bazooka man, Pfc. Martin, was placed in an alleyway between two houses. When the first tank nosed by the alley, he put one round through its weaker side armor, instantly stopping it. Then a BAR man went to work on the men riding on and walking behind the tank.

After that things went from bad to worse; we were beginning to be surrounded and unfortunately we had only one bazooka round left. To top it all off, we found that we couldn't make contact with the first squad in the next building. Then the order came to withdraw by way of the hospital. That was all right with us. We couldn't find some of the guys, and some had taken off; we didn't know who had done what, and it would have made too much noise to yell for them; so after one quick look through our buildings we all took off. Back at the center of town we let L Company take over for a while.

Company L had left the last tunnel at 2200, when the town was reported to be clear, and reached town about midnight, just as K Company was pulling back. Most of the company took positions in houses while Canfield, with a rifle grenade, and Blair, with a BAR, attempted to stop the second of the tanks. It withdrew sounding as if a track had been damaged, but nevertheless kept firing at us. The enemy apparently did not have enough men to clear houses in the dark, although their numbers were estimated to be as high as 150. They were not combat troops, but men from air and service forces. Just before dawn the Germans withdrew to the north, taking two riflemen and one medic from K Company as prisoners.

After daylight the companies collected their men, some of whom had hidden in houses the Germans thought they had cleared; they moved through town again to make sure the Krauts had really gone.

Torbole had been a very pretty place, the kind you see pictured on Italian tourist posters, a clear blue lake, a small clean town on the shore, steep mountains, and a ruined castle on a promontory above the town. Torbole now, however, had been the scene of fighting for a day. Formal gardens had shell craters in them, trees were shattered, and shops had been blown open and the merchandise scattered in the street. Although the search disclosed

no live Germans, it did turn up a surprising number of souvenirs.

Regimental headquarters moved up to town that morning, and supplies and artillery began coming up on ducks and by sailboat. Once again shells fell in the town as the Germans attempted to hit the vehicles and vessels moving in and out of the small Torbole harbor. Most of the shells landed harmlessly in the water, but occasionally one would land on the road along the shore. One of these killed Regimental Sergeant Major Evans and Colonel Darby, famous as a leader of the Rangers, who had just been transferred to the 10th Mountain Division as assistant commandant.

About noon a small patrol from I Company moved out to inspect the bridge over the Sarca River, on the road to Riva. The bridge had been destroyed, but a foot-bridge was still intact a short distance upstream. The patrol proceeded toward Riva, past well-made and well-concealed positions in the base of the ridge separating Riva from Torbole. A fairly large force of Germans was pulling out of Riva as the patrol moved in, and they began to come back into town when they realized that our patrol consisted of only about fifteen men. The 2d Battalion arrived in time to change their minds. The only shots fired were between the partisans and the departing enemy.

By that evening the 3d Battalion, following the 2d, had settled into and around a 300-year-old villa just vacated by German officers; the quarters were comfortable, and to add to the luxury, an issue of clean clothing was begun there. L Company, in response to a dramatic partisan note from the town of Arco, which ended, "We cannot hold out much longer," moved north five miles on the morning of the 2d and took the town without incident. Meanwhile, the issuing of equipment continued, and sleeping bags were included. There were higher, colder mountains to the north, and preliminary plans were being discussed for a further attack along the high Alpine ridges leading toward the Germans' last-ditch "Redoubt." With one eye on these higher mountains and their fortunately unoccupied, all-but-impregnable prepared emplacements on the slopes we had already passed, we strolled around the streets of Riva to see what we could, while we might, of one of Italy's most beautiful resort cities.

Riva and Torbole, to judge from the red crosses on almost all

buildings, had been used largely as a hospital area. In addition, however, we found underground factories, the most extensive of them being devoted to the manufacture of airplane parts. On the shore of the lake an astounding discovery was made. We had already seen ducks, assault boats, and sailboats on the lake. There had been a steam-driven ship there as early as 1828, and a boat propelled by the harnessed power of a horse going around the deck in circles had antedated the steamer. Consequently we should not have been surprised to find in a lakeshore shed an almost completed submarine. It was very small, but it would seem to indicate that the Lake of Garda was to have been the last home of the Italian navy. Clearly the 10th Mountain Division could achieve nothing finer. It had captured the navy intact!

Odd information had been filtering down from higher headquarters for some time. Back in the Apennines we had been told twice that at a certain time on a certain evening a German plane would fly over the lines and was not to be fired on. On another occasion we were to be on the lookout for a German who would come to our lines and give a certain name. He was to be sped to the rear. Then, on April 30th, we had heard that there was to be no further air support in the theater. Two days later we had been ordered not to fire on Germans who looked as if they didn't want to fight. Arco had fallen without a shot.

At about 1700 on May 2, in the Battalion CP at San Alessandro, the phone rang. They wanted "Blue 6," the Battalion Commander, and Captain Everett Bailey answered. He listened intently, as usual.

"What?" he asked, in a rather unmilitary manner. And the message was repeated to him. He smiled and grabbed my arm.

"Dave, the war is over in Italy!"

Four days too late.

Postwar Mountain Training

By LIEUTENANT COLONEL ROBERT C. WORKS

[A war is over, and it is not pleasant even to contemplate another one—especially in the pages of a conservation journal. Nevertheless, the tools of war have not yet been scrapped, and military training cannot be forgotten until they are. Until then it is well that Sierra Club members, among whom are many who contributed substantially to the army's past mountain training program, should be aware of present needs in postwar mountain training. An adequate program is now in progress at Camp Carson, Colorado. That program is in danger of being seriously weakened. The article which follows describes comprehensively a program which ought to exist—and persist.

Colonel Works was with the Mountain Troops from September, 1942, until the 10th Mountain Division was deactivated in 1945. He graduated from West Point in 1938, was with the 87th Mountain Infantry on Kiska, was Senior Technical Adviser, Mountain Training Group, West Virginia Maneuver Area, served as G-2 of the 10th Mountain Division for eight months, and from February, 1945, throughout the remaining months of heavy combat, commanded the 3d Battalion, 87th. He, of all the higher-ranking officers with whom I came in contact, was the most alert to the tactical and technical needs of mountain training and mountain fighting.

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THE campaigns in the Mediterranean Theater were fought in rugged, mountainous country. In Greece and Crete and in Tunisia, Sicily, and Italy, "the soft underbelly of Europe" consisted of jagged peaks, deep canyons, and natural solid-rock fortifications which, by comparison, made man-constructed barriers seem like "logical avenues of approach." Most of the campaigns in the Pacific from Attu to Okinawa have been fought in equally precipitous terrain, and the attacks on the home islands of Japan would have been mountain

combat from the landings on the beaches until the Marine photographers had reached the peak of Fujiyama. What has been done in the past and what can be done in the future to prepare our Army for mountain combat?

GROWTH OF MOUNTAIN TRAINING IN OUR ARMY

Little attention was paid to mountain combat during the period between wars. Our training and maneuver areas were purposely located in flat or rolling country. Where mountains existed, they were avoided as being impassable. Yet our civilian army, generally untrained for mountain fighting, successfully completed in Italy the longest, bitterest mountain campaign in history.

On prewar maneuvers in Hawaii and the Philippines, certain mountainous areas were not occupied because they were "impassable." Our battle maps showed areas in northeastern Luzon, where our divisions were fighting, as "unexplored." The Zambales mountains, through which the Japanese moved at will, were not "feasible avenues of approach to a large force," and were used to hinge the left flank of the Philippine Division on its annual maneuvers. Even Mount Mariveles on Bataan was not completely occupied during the maneuvers of 1939.

Indications that armies could live and fight a modern war in the mountains began appearing with the Italian invasion of Ethiopia, followed in rapid succession by the Spanish Civil War, and the invasions of Norway, Yugoslavia, Greece, and Crete. When the Japs landed at Lingayen Gulf, our mountain training program had just begun, too late to help those on Bataan, New Guinea, or Attu.

The 87th Mountain Infantry was organized in December 1941. At that time there was no precedent for training a mountain soldier. Instructors were either skilled civilian mountaineers or qualified army officers without mountain experience. Training the soldier to be a mountaineer, or the mountaineer to be a soldier, was a trial and error proposition which required the better part of two years.

This fumbling process was not made easier by the existent training literature. Foreign manuals were carefully studied, but their entire doctrine was impossible to apply to American soldiers training in American mountains. A minor point which illustrates the difficulties of using foreign training literature is the subject of shelter. European mountains are comparatively heavily populated, and Eu-

ropean mountain troops assume that billets will always be available. Small forces on patrol might be required to bivouac above timberline for short periods, using tentage; but generally they could depend on sheep herders' cabins or ski lodges. To bivouac battalions or divisions under canvas above timberline was considered impossible. Yet our mountains are almost unoccupied, and we had to develop our own technique and equipment for sheltering large bodies of troops. Finally the doctrine of mountain training crystallized in two Field Manuals: the revised *Operations in Snow and Extreme Cold* and *Mountain Operations*. These were not published until mountain-trained units were in combat.

Untold time and money were spent developing and testing skis, ski boots, and ski waxes; rock pitons and ice pitons; Manila hemp and nylon rope; a dozen oversnow vehicles, ending with the M-29 or Weasel; mountain clothes and mountain rations; and every article of clothing and equipment that a man carries on his back. European equipment, developed for a particular mountain range in a damp temperate climate, could not be used by troops who might fight in Alaska, the Bontocs [the Philippines], or the Kuriles. Our equipment was developed by partly-trained mountain soldiers, who at first were not quite sure what they wanted. But as the mountaineer gained in experience, and his technical doctrine developed, his equipment improved until now we have the finest mountain equipment of any army in the world.

As the 87th Mountain Infantry expanded into the Mountain Training Center and later into the 10th Mountain Division, other experiments in mountain and cold weather training were carried out. In the spring of 1943, one regimental combat team of the 36th Division and the entire 45th Division trained under the Mountain Training Center in the Blue Ridge Mountains of Virginia. During the winters of 1943 and 1944, the 28th, 35th, 77th, and 95th Divisions trained to live and fight in the mountains in the West Virginia maneuver areas. The training in these maneuver areas followed a general pattern and included specialized, individual, and unit training.

Specialist schools in rock climbing, mountain medical evacuation, skiing, and mule packing began training an advance detail of picked men from each unit three weeks before the arrival of the unit in the maneuver area. Approximately ten men per company received this

training under the expert instructors of the Mountain Training Group. In combat these men could be used as a team to accomplish some difficult mountain task. In training they were used to guide and instruct the other members of their unit.

This personnel, and the regularly assigned mountain technical advisers, supervised the individual and small-unit training of the company during the first week and a half in the maneuver area. During that period all men were taught elementary rock climbing, mountain marching, stream crossings, signaling, the use of rope, and bivouacking in rugged, cold country.

The last week and a half was spent in company, battalion, and regimental combat-team problems. These exercises were designed to test the application of the techniques learned during the earlier training. As these exercises were continuous, the supply problem was continuous, and became more difficult as the operations progressed. Many sound tactical plans failed because the commander had not coördinated the use of jeeps on the poor roads, the use of mules on trails, and the use of packboards where no trails existed. Other plans failed because they did not coördinate the trail-building, mountain-stream crossing, bridge-building, and rock climbing required in a canyon crossing. But all units learned the immense difficulties inherent in mountain operations and, most important, they learned that, by improvisation, planning, and determination, these difficulties can be overcome.

The wealth of mountain experience gained by individuals and units in the mountain maneuver areas of the United States only supplemented that learned in combat. Most of the mountain-trained troops in the Army today are combat-trained. In Italy the 3d, 34th, 36th, 85th, 88th, and 91st Divisions learned to fight in the mountains the hard way on one of the war's toughest fronts. Two units in Italy, the 45th Division and the 10th Mountain Division, had received varying amounts of pre-battle mountain training, and their combat records and the words of their commanders testify to the value of learning before the bullets start to fly.

The bitter lessons in tactics which appear in combat reports were learned by trial and error. Mountain combat, from the ground up, had to be learned by each unit as it was committed for the first time. *Lessons from the Tunisian Campaign* states: "In order to advance successfully, troops had to avoid natural corridors of approach

which were invariably mined and heavily defended, and work along ridges and high terrain features."

Supply is another totally different problem in the mountains, where three hot meals per day applies only to rear echelons. The most modern and primitive methods of transportation had to be devised during combat: air and back-packing. The 45th Division had carried overseas a few of the packboards with which it had trained in the States. From these models, other organizations had packboards constructed locally in the theater. Mules were another problem. Few of our motor-minded city-bred soldiers knew the fuel consumption, rated-load capacity, and first echelon maintenance of a jarhead, Alpini, M-1. Basket, squaw, or diamond hitches were not even part of the military vocabulary of a World War II soldier. And finally, Cub planes had to be impressed into the service of ration, water, and ammunition delivery to units beyond the reach of ground transport.

Equipment was initially inadequate. The high rate of trench foot can be laid to the lack of proper footgear and a lack of planning for a daily "sock exchange." Numerous casualties were suffered before troops were equipped with heavy woolen ski socks, shoe-pacs, sleeping bags, jackets with hoods, and sweaters. The old GI shoes and leggings, overcoats, and blankets were found wanting in a mountain war. But even the finest equipment can be misused by inexperienced troops, as was proved during the winter of 1944-45 by the still persisting trench foot, the prevention of which is a command function. Troops must be taught during training, before casualties really hurt, how to use the fine mountain and winter equipment they will be issued in combat.

The progress in training methods, technique, and equipment of mountain warfare made in our training areas and on the battlefield during nearly four years of costly hit-or-miss experimentation must not be lost to our Army during the years of peace.

THE VALUE OF MOUNTAIN TRAINING FOR THE INFANTRY DIVISION

Mountain warfare includes specialized techniques, but principally it requires the ability to overcome obstacles. The soldier who has maneuvered in the Alleghenies or the Rockies is confident when he is confronted by the small man-made obstacles of the flatlands. The mountain-trained divisions of the Fifth Army which had scaled the

sheer slopes of the Apennines did not hesitate when they reached the Po River. And if any of our future battles are fought on the plains or the beaches, troops such as these will fight with the assurance that no difficulties that they may encounter will equal those known in the Aleutians, in the Apennines, or on maneuvers in the Rockies.

Our troops should be trained in the mountains during training periods. The mountains should not be reserved for specialized, elite mountain troops, but must be a part of each infantry division's unit training, which should include combined maneuvers. The value to the unit is threefold.

First, maneuvers in rugged terrain with a limited or nonexistent road net more nearly approach battlefield realism. Where bullets or flags fail to halt the unnaturally rapid movement on normal maneuvers, the difficulties of fighting the terrain and the difficulties of supply, control the action in a mountain field exercise. Commanders learn the importance of a sound supply plan which may include road building, jeep shuttles, mule-packing, back-packing, and even horizontal or vertical hauling lines across a canyon or up a cliff. Even when the umpiring breaks down in the ammunition play, the commander must still provide his troops with rations and water which can often be a major supply problem in itself.

Second, the commander has an opportunity to judge his subordinates' ability to accomplish a difficult task. A regimental commander after crossing the Blackwater Canyon in the West Virginia Maneuver area stated that he was then able to correctly judge his officers' capacity in accomplishing the impossible. Junior leaders had also tested their men under combat conditions and could replace those platoon or squad leaders who were found wanting. This unit did not have to wait until combat to get rid of its deadwood.

Third, the individual soldier had learned to fight as a doughboy. He learned that the infantryman is not the streamlined, modernized, truck-riding soldier that the news magazines picture, but that even today the foot soldier must often pack his weapon, his ammunition, his rations and his bedding, just as Stonewall Jackson's foot cavalry did eighty years ago. He learned to pack and lead a mule, sleep in the snow, and control his fear as he clung to a rock face three hundred feet above the valley floor. He learned to use rope—a rapidly disappearing art in our Army. He learned to pack seventy-five pounds of ammunition on a packboard and to tote it over the

mountains. These and a thousand other techniques of mountain fighting he learned, but principally he was hardened physically and mentally.

The back-breaking efforts of a mountain operation develop the body as no system of calisthenics or group games will. Movement from the bivouac to the mess line is an exertion. Legs, arms, and chest are further developed in rock and ice climbing. But in all physical conditioning, the accompanying mental hardening is the vital factor.

The mountain-trained soldier has mastered new and strenuous physical accomplishments. He has overcome his inherent fear of high places. He has tramped over rough country, twenty to twenty-five miles in a day, with a 4,000 vertical foot change in elevation. He has slept in sub-zero temperatures and knows how to stay alive in a blizzard. Weeks on a transport and in a staging area, and months in a wet foxhole will soften him physically, but he will remain mentally hard and sure of himself. The mountain training given to a handful of our infantry divisions just before they went overseas should be included in the peacetime training of our entire postwar Army.

THE VALUE OF SPECIALLY TRAINED MOUNTAIN DIVISIONS

To perpetuate the skills of the highly specialized mountaineering that was taught to our Army by civilians after the war began, at least one mountain division should be retained in the peacetime Army.

Nearly all countries which we may be called upon to fight have rugged, mountainous terrain. During both world wars when the fighting on the plains became stabilized, the armies moved units into the mountains. These units succeeded or failed, depending on their ability to live and fight in broken terrain.

In the recent war where a dozen specially trained mountain divisions could have been used profitably in Italy, only one was available during the last few months of the campaign. This mountain division was able to accomplish with more ease the difficult missions that other divisions had been doing the hard way during almost two years of mountain fighting.

During its four months of combat the action of the 10th Mountain Division cannot be considered a complete test of a specialized

mountain unit. However, enough was learned of its capabilities to justify the retention of a mountain division in the Army.

The nature of the army group mission, during the winter months of 1945 in Italy, prohibited a large scale oversnow operation. But numerous patrols using skis and ice-climbing equipment were sent out against an enemy which was only able to move on the plowed roads and trails. During the month that the deep snow lasted, no enemy patrols were able to penetrate friendly lines, yet ours moved at will in No Man's Land. These troops were also trained to operate oversnow vehicles and they maintained outposts on the highest snow-covered ridges.

The first offensive operation of the 10th Mountain Division was the attack of the Campiano Ridge. This precipitous mountain was seized by trained rock climbers scaling sheer cliffs. Climbing this ridge was possible only for specialized mountaineers. Its seizure gained observation of enemy positions, denied enemy observation of our positions, and secured the Division left flank in the succeeding offensive on Mount Belvedere.

Later operations of this division were similar to those of other divisions in Italy since 1943, except that, trained and equipped for rough country, it could accomplish the job more readily. When the 10th hit the billiard-table-flat Po Valley it left its animals behind, and without hesitation picked up its motor transportation and began the pursuit to the river. As the first unit across the Po, the 10th Mountain Division raced on to the foothills of the Alps along Lake Garda, and when the war ended, it had already begun the difficult push through the Alps.

If in a future war there is no demand for mountain-trained troops, the mountain division can instantly and effectively be used as a standard infantry division, a policy often practiced by the Germans. But the continued training of a mountain division during time of peace to develop new technique and tactics, and to provide a cadre for rapid expansion in case of war, will be cheap insurance against sending untrained men to fight in the mountains.

POSTWAR ORGANIZATION

Postwar mountain-trained units should be included in our peacetime organization and become a permanent part of our Army. Mountain units in the Army should include at least one mountain infantry

division and several separate mountain infantry battalions. All infantry divisions should receive at least one month of mountain training each year or in each two-year period, depending on the length of the enlistment period.

1. The Mountain Infantry Division.—The mountain infantry division should be organized under a standard infantry table of organization. This T/O, however, must be flexible enough to allow modifications when the unit operates in alpine terrain, or low mountain terrain without roads. The addition of at least three mule pack companies and the substitution of mules for trucks will be required in low mountains. The substitution of oversnow vehicles and toboggans for mules will be required in alpine terrain. In the summer in mountains similar to those in Italy the standard organization and equipment of an infantry division is the most satisfactory. The one point which all units have learned in this war is that T/O's and T/E's are a handy guide, but must be modified to fit a certain terrain or a particular situation.

Because of the time required to train mountaineers, the conscripted personnel of the division should be selected on the basis of their civilian experience. Civilian skiers, mountain climbers, and those conscripts from the northern mountain states will fit in more readily in a high mountain unit. Experience has shown that officers and men reared in states with terrain and climate similar to Idaho, Minnesota, and Maine adapt themselves more rapidly to the severe weather and high altitude in which mountain troops must train.

The mountain infantry division should train under the most difficult conditions of terrain, climate, and altitude, preferably in the Rocky Mountains. It must, however, have some training in the low mountains of the Coast Ranges or the Alleghenies. And finally it must maneuver on the flats against standard infantry divisions, for all mountain units in combat will eventually fight their way out of the hills and into the valleys, where they must be able to adapt themselves to the faster-moving mechanized warfare of the plains.

2. Separate Mountain Infantry Battalions.—Separate mountain infantry battalions should be organized to provide a unit capable of performing the highly specialized tasks of alpine combat. These units should be attached to each standard infantry division operating in the mountains. All members of the battalion will be highly proficient mountaineers capable of operating in deep snow, on high

rocks, and over glaciers. The battalion will provide the experts required by an infantry division which has received a minimum period of mountain training.

This battalion may be used as a unit on skis for long range over-snow reconnaissance. It can be used as flank security on the higher snow-capped peaks while the division moves through the low mountains. The battalion can provide ski patrols, establish outposts and observation posts on high pinnacles, guide troops over rough country by picking the easiest routes, train replacements in elementary mountain combat, and install fixed ropes and hauling lines up cliffs and across canyons for the less experienced men.

During peacetime, the primary mission of this battalion will be the mountain training of infantry divisions. The battalion will be organized to fit the existent infantry division T/O so that it may be broken down and attached to the subordinate units of the division, providing a small group of trained instructors for each company.

These battalions should consist of Regular Army enlisted men, highly trained in their specialties. They will be basically infantry with a working knowledge of the particular branch they are to instruct. The problems of moving a pack howitzer across a canyon are little different from those of moving an infantry jeep up a cliff.

As this battalion has a dual mission: (1) training infantry divisions for mountain warfare, and (2) fighting as an infantry battalion in the high mountains, the organization must dovetail with the infantry division T/O and still be workable in combat.

The total strength of this battalion should be figured on the basis of assigning eight to twelve enlisted men to each company of an infantry division. This will total thirty-five officers and 842 enlisted men, roughly the size of a standard infantry battalion. During combat or on maneuvers the enlisted men attached to the company could be used by the company commander as a group, or could be further attached to platoons. The officer and forty enlisted men of the infantry mountain battalion platoon could be used by the battalion commander as a maneuvering force, or he can attach the squads to his companies. Similar use may be made of the companies and the battalion by the regimental or division commander.

During the mountain-training period of the infantry division, the mountain battalion headquarters, under AGF directives, can supervise the specialized, individual, and small-unit training. It should

also write the problems and direct the mountain maneuvers of the division.

Such a battalion will fulfill the division commander's combat requirements when he must fight his division in high mountains, and it will fulfill his training requirements when he must teach his division to fight in rough country.

3. Mountain Training for all Infantry Divisions.—The need of mountain training for all infantry divisions prior to combat has been proved throughout the war. To fulfill that need, a number of mountain-training areas should be set up after the war following the pattern of the West Virginia maneuver area. Each division in the Army should be given mountain training during each conscription period. Three weeks before the arrival of the division in the maneuver area, picked men can be sent to specialist schools in rock climbing, skiing, mule packing, ice climbing, or medical evacuation. The division will spend two weeks on individual and small-unit training and two weeks on maneuvers instructed by their own trained specialists and by the separate mountain infantry battalion in charge of the maneuver area. By using the skills and technical knowledge of this trained personnel, the infantry division can leave the mountains, thoroughly familiar with the problems of mountain warfare and with confidence in its ability to live and fight in any terrain.

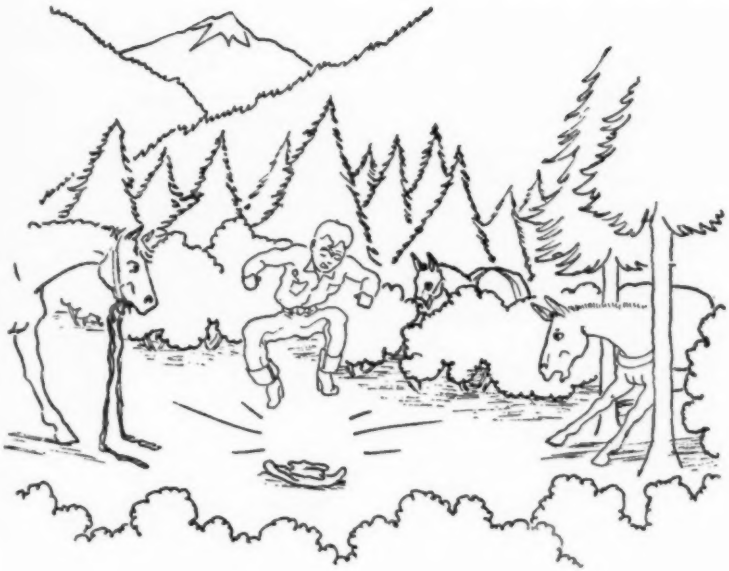
With an organized mountain division and separate mountain battalions, and with a program for training all infantry divisions in mountain combat, the specialized skills, tactical knowledge, and training doctrine so laboriously acquired during the war will be retained for a possible future war. New techniques and doctrines will be developed. The men will learn military skills which will be practiced as civilian sports after discharge, thus providing a pool of trained, physically-fit replacements. And finally, trained men will be ready to cadre new divisions and battalions, if our country must fight another war in the mountains.

TRAIL MAINTENANCE

By "SHASTA BILL"
As told to Joe Noble, FCA, Shasta National Forest

BY LOOKING THROUGH THIS ALBUM OF EXPERIENCE ONE CAN EASILY SEE WHY TRAIL STANDARDS HAVE BEEN DEVELOPED AND MUST BE FOLLOWED.

This is our "string" in the back country of the Average District of the Typical National Forest. That's Cactus, the Improvement Foreman who also does the packin', ridin' on me up in front, and I'm Shasta Bill. Next is Jerry and way behind, as usual, is Molly. We had a good time up there in spite of a lot o' pitfalls on our trails. They didn't bother us, except for bringin' out the short side of "Cac's" temper. We could jump some of the logs and beat our way around the others through the brush; the "bayonets" cut us some but we healed quick, and a few rocks or a good swim didn't hurt us none, but Cactus would get mad at the things the trail crew passed up and then he'd like to bust his cinch and we'd be sure of eatin' our grain in the dark 'cuz he'd spend hours hackin' at a tree with a brush knife or kickin' rocks with his boots and cussin' all the time—like the time we was comin' down Galt Canyon in the late afternoon an' . . .

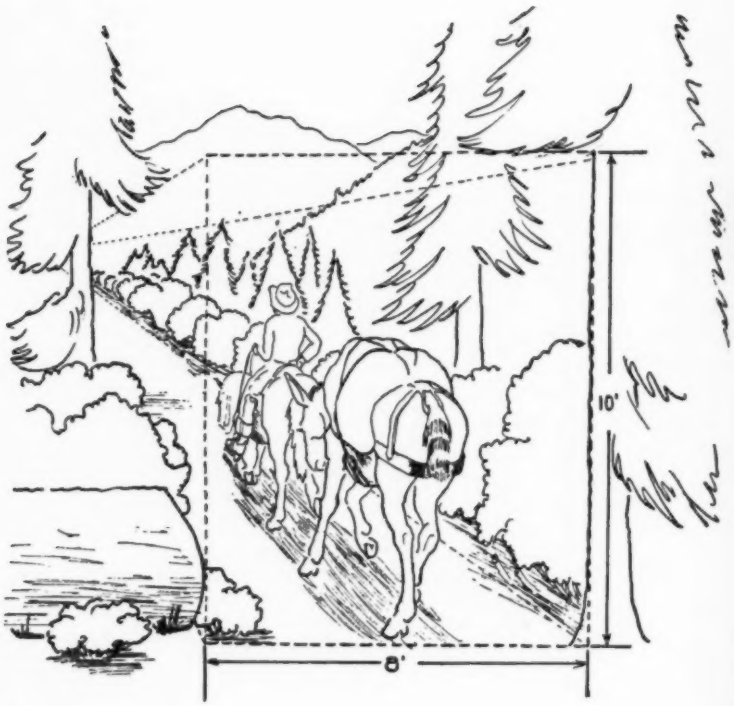


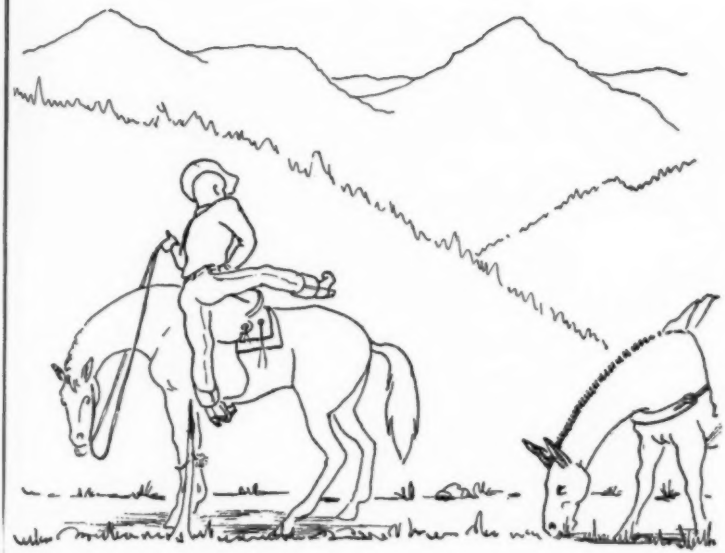
. . . I could feel 'im tense as we passed through two trees about thirty inches apart. He pulled me up an' turned to watch the packs. Jerry was too wise to try it an' beat his way around through the brush, but Molly barged right into 'em an' o' course got hung up. "Cac" crawled off an' tromped his XXX Stetson to a pulp an' makin' the air as blue as the Jay a settin' in a Fir an' squawkin' to high Heaven. Molly backs out o' there an' in good time too, 'cuz "Cac" starts to work on that tree with a brush knife an' we figgers on late oats again—just 'cuz the trail crew hadn't stopped to look at the trail manual, page 9, "4 feet from center line on each side" as "Cac" says. The proper way, as you can see over here is . . .

BE SURE SIDE CLEARANCE IS THE FULL 8 FEET REQUIRED

. . . the 8-foot by 10-foot rectangle. The boys did a swell job here an' Cactus got this picture an' drew in the lines. It was sure nice travelin' down a trail like that. Made you want to bow your neck an' prance but "Cac" would relax an' enjoy himself an' I'd a' got into trouble if I'd let myself go. He kept harpin' on that "8 by 10 rectangle" an' in a few years we'd got caught up on all our trails an' it would be a pleasure to take off on a long trip. However, we had some rough sailin' before we'd got to that stage. We gave "Cac" some tough times too, like the time we wuz moseyin' down Kickapoo Creek an' . . .

THE 8 BY 10 RECTANGLE IS THE KEY WE MUST ALL REMEMBER FOR CLEARING.





...he pulled me up on the trail for somethin' we never got. I see he wuz gonna step off an' make a three point landing on a "bayonet" the trail crew had passed up. I coulda' stepped up but didn't. Cactus made the landing and all h–l broke loose. We got a week's rest; "Cac" lost 5 days sick leave an' a trail crew. I made amends by steppin' easy fer a couple o' weeks. To this day...

ALL STUBS, BAYONETS, ETC., MUST BE REMOVED.
CUT AS NEAR TO GROUND AS PRACTICABLE.

. . . I prick up my ears when I see a "bayonet" a loomin' up. "Cac" always goes on by to see what could o' happened if he hadn't seen it an' to lend justification to the stream of profanity that's sure to follow—an' fer a week after, the trail crews hadn't better let him see 'em workin' without a long-handled pruning saw with 'em. He tells 'em it's in the trail manual—page 9.

STUBS, LIMBS, BAYONETS, ETC., MUST BE CUT AT TREE TRUNKS.

It would have saved me a lot o' worry too, if they'd a packed one o' those long saws. Cactus used to run into a "face-slapper" the crew'd passed up. He'd grab his brush knife—stand up on the saddle an' beat on it 'til I was a nervous wreck. If he'd a missed an' lost his balance, I'd a gone through life with one ear. I'd raise my head an' watch so I could duck if I had to an' about that time he'd get the limb hacked off an' I'd get my ears full of needles. For the rest of the day it was a toss-up as to who had the shortest temper until we run into a situation like this . . .

**ANY ONE LIMB LEFT IS ENOUGH TO HURT A PERSON—
OR RUIN A TRAIL RATING.**

. . . when I had to concede top honors to him. For some reason, known only to the trail crew, they insisted on making a cut of not more than 18 inches from big logs across the trail. Then we'd have to catch up the mules, take off up over the bank and around the end of the log. Logs like this were harder on "Cac's" temper than almost anything else, 'cuz he couldn't very well hack 'em out to size with a brush knife. He's made the trail crew backtrack as high as 5 miles to finish cutting one of these logs, with a whole day's progress lost. Speakin' of backtrackin', one day we came up on . . .

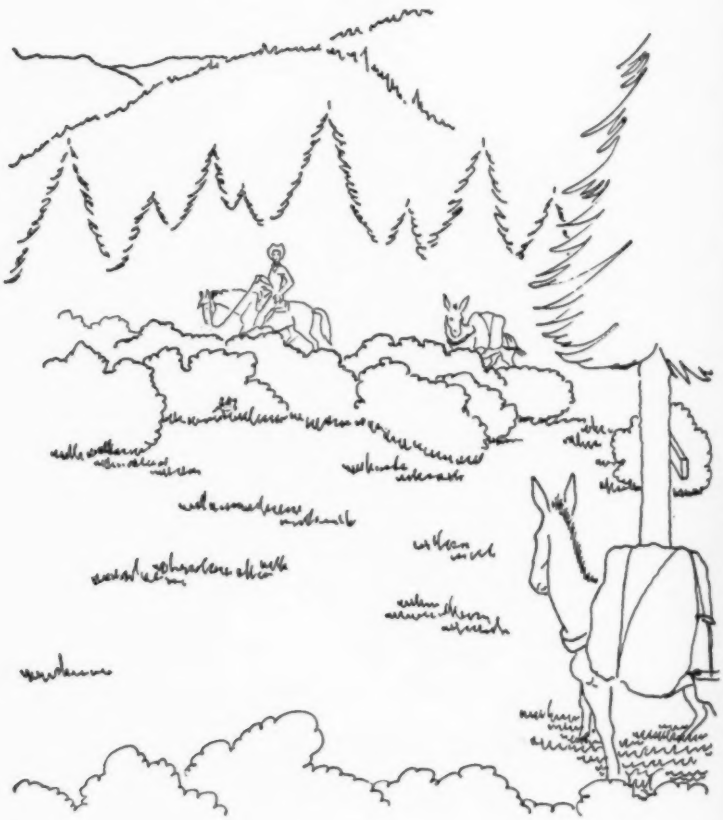
THE 4 FEET EACH SIDE OF CENTER LINE APPLIES TO LOGS AS WELL AS BRUSH.

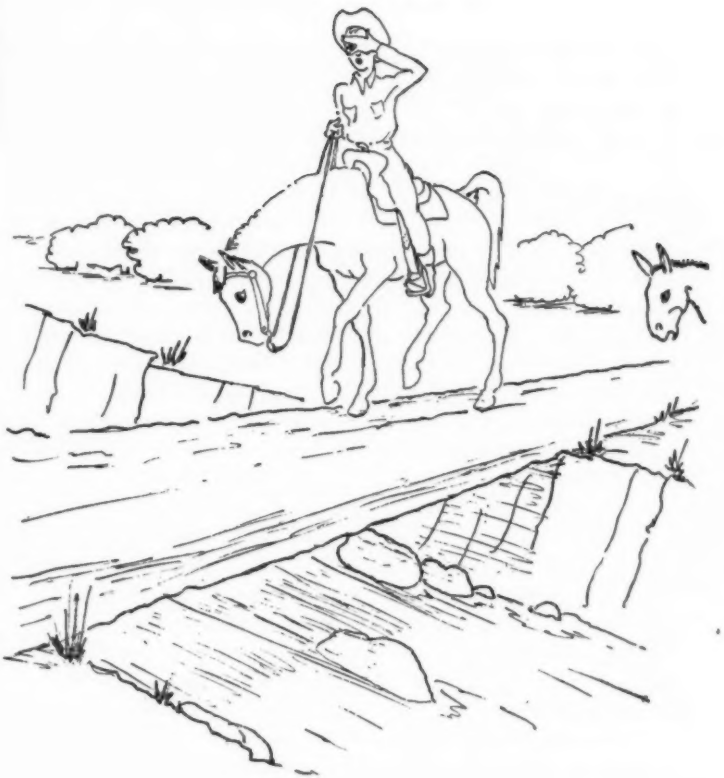
. . . a couple o' hikers in the big flat at the head of Bear Creek. About four trails intersect there and the two hikers were puzzlin' over a map, trying to find which trail to take to Bear Lake. It was a puzzle if you didn't know the country 'cuz every way you looked there were blazes on the trees. We'd just packed up the signs for this place and the trail crew had forgot to post 'em as they went by. Cactus set the hikers right and then we high-balled for camp and he made the crew leave their supper and walk a mile and a half that evening to post those signs. They were sure mad but they didn't overlook signs again. Cactus forgave 'em and complimented 'em on the good job they did . . .

EACH INTERSECTION OR "BLIND SPOT" MUST BE SIGNED. SIGNS MUST SHOW DIRECTIONS AND DISTANCES.

. . . routing the trail around the wet meadow just below their camp in Bear Creek. It had been getting boggy and I always hated to start through it before, but they cut a good trail around it and posted signs and all in all it was a good job. You can get a square meal there now, and before the feed had been tromped out and all muddied up.

TRAILS MUST BE ROUTED AROUND WET MEADOWS—
NOT THROUGH THEM.





"Here's one place where I gave Cactus a thrill. We were going up to the trail camp on the East Fork trail and when we came to the East Fork crossing we found that the crew hadn't fixed the ford but had crossed on a big log just above it. Cactus pushed me up to the log and sat there cussin'. He slapped my neck with the reins and I thought he wanted to go across so I jumps up on the log and it was too late for him to turn me so he held his breath and away we went. Jerry gave up and tried the ford and got himself all skinned up. At the camp Cactus gave the crew a lecture on fords that would shame a congressman and the next day they donned their boots and fixed her up.

FORDS MUST BE CONSTRUCTED SO AS TO MAKE A PERMANENT, SAFE CROSSING.

Belaying the Leader

By RICHARD M. LEONARD and ARNOLD WEXLER[1]

"A LEADER," wrote Geoffrey Winthrop Young, "absolutely must not fall." And in writing this he was summing up the philosophy of the classical mountaineers among whom he is perhaps the greatest. Young had to say this. He knew only too well what usually happened when a leader fell. Either the leader's rope, or the belayer's method of handling it, would not stand the shock, and tragedy resulted. Too often the climber's rope did not bring to mountaineering the safety it was traditionally supposed to bring—that we now believe it can bring.

Suppose an accident overtakes a climbing party, and the leader is falling. Three things might happen. (1) The rope can be poor, can break, and the leader is lost. (2) The rope can be good, but the belayer unskilled, with the result that the party is lost. (3) Or both rope and belayer are sound, the fall is checked, and the leader is ready to try again—perhaps after a few minor patches.

What, then, is the story of the advance of rope making and rope handling? How has the rope factor of safety increased, and what has recent wartime research contributed to safety in the sport of mountaineering? We shall attempt to answer these questions here.

For more than a century the use and management of the rope in high-angle climbing has been considered to be one of the primary factors in maintaining the safety of the party. Over a period of eighty years many writers have attempted to analyze the strength of the climbing rope and its limitations in checking the fall of a climber.[2]

[1]Leonard organized the first rock-climbing section of the Sierra Club in 1932; is a member of its committee on mountaineering, and is also a member of the American Alpine Club. Wexler, a member of the rock-climbing committee of the Potomac Appalachian Trail Club, is a physicist at the National Bureau of Standards.

[2]"Ropes, axes, and alpenstocks," *Alpine J.*, Sept., 1864; 1:7, pp. 321-326.

"Equipment for mountaineers," *Alpine J.*, Nov., 1893, 16:122, appendix, pp. 3-7.

Bell, J. H., "The strength of climbing rope," *Scottish Mtnrng. J.*, 1897, 4:24, p. 347.

Thompson, Gilbert, "Some mechanics of the rope and axe," *Scottish Mtnrng. J.*, 1908, 10:55, pp. 17-25.

Lister, G. A., "The limit of strength of the climbing rope," *Rucksack J.*, 1911, 2:1, p. 38.

Bird, A. C., "The strength of ropes," *Climber's Club J.*, 1931, 4:3 (n.s.), p. 192.

Goodsell, B. L., "On the requisite strength of a climbing rope," *Climber's Club J.*, 6 (n.s.), p. 38.

"Report on rope: Tensile tests," *Alpine J.*, Nov., 1931, 43:243, pp. 325-329.

Donkin, S. B., "Report on rope: Elasticity," *Alpine J.*, May, 1932, 44:244, pp. 107-110.

As a result of such studies many of the best of them have tended in effect to agree with Underhill as a "lamentable fact, deduced from numerous tests, that if a leader falls clean from over eight to ten feet above, sustaining a sheer drop of sixteen to twenty feet or more, the rope (*any* rope practical for climbing purposes) thus rigidly fixed, will most certainly snap."[3]

Searching for a means of avoiding such tragic results, several mountaineers have recognized the great importance of resiliency in absorbing the force resulting from the sudden shock of a fall. Young advocated interposing as much body resiliency and spring as possible between the climber and the belay point. He states "if we are protecting a leader, whose fall would jerk us off most positions of free balance, we belay the rope over the [rock] point and play it round with both hands, ready to grip and spring it upon our arm and shoulder if a jerk comes. . . . Corrective action is practically confined to doing all we can to spring the rope, with arm, hand or body, so as to lessen the chance of its snapping."[4] Thompson of the Scottish Mountaineering Club, Donkin of the Alpine Club, and the Uto Section of the Swiss Alpine Club have all recommended allowing some "slip" of the rope to increase the total resiliency.[5] Several others have recognized in general terms the vital need for maximum resiliency. The tragedy has been, however, that after realizing the need for resiliency, none of them has clearly explained how to obtain it. This caused Underhill to exclaim as recently as 1931, "The rock-climbing world is in dire need of a specific treatise . . . describing in detail the

"Corde di Montagno," *Rivista del Club Alpino Italiano*, Jan., 1932, 51:1, p. 54.

Cosyns, Max, "Resistance des cordes aux chocs," *Revue d'Alpinisme*, 1938, 4:1, pp. 55-61.

Goodlet, B. L., "The climbing rope: Tension due to a fall," *J. of the Mtn. Club of South Africa*, 1938, no. 41, pp. 15-19.

Mears, R. P., "Specifications and system of tests for the climbing rope," mim. rept. to the British Mtnrng. Council, Nov., 1945, 9 pp.

[3]Underhill, Robert L. M., "On the use and management of the rope in rock work," *S.C.B.*, 1931, 16:1, p. 80.

Maduschka, Leo, *"Neuzeitliche felstechnik,"* 1931, translated and condensed by E. A. Stewardson as "Modern Rock Technique," in *Mtnrng. J.*, May, 1933, 1:3, pp. 156f.

Abraham, George D., *Modern Mountaineering*, London, 1933, p. 150.

Blanchet, E. R., "Rock Climbing," in *Mountaineering* (Lonsdale Library, Vol. 18), London, 1934, p. 97.

Brunning, Carl K., *Rock Climbing and Mountaineering*, Manchester, 1935, pp. 33-34.

Peacocke, T. A. H., *Mountaineering*, London, 1941, p. 5.

Henderson, Kenneth A., *Handbook of American Mountaineering*, Boston, 1942, p. 13.

Barford, J. E. Q., *Climbing in Britain*, Middlesex, 1946, p. 59.

[4]Young, Geoffrey Winthrop (ed.), *Mountain Craft*, London, 1920 ed., p. 221; 1945 ed., pp. 172 and 213.

[5]Thompson, *op. cit.*, n. 2.

Donkin, *op. cit.*, n. 2.

Swiss Alpine Club, Uto Section, "The technique of alpine mountaineering," 1936, p. 18 (transl. of *Technik des bergsteigens*).

various attitudes possible for [Young's] indirect body belay; meanwhile, its arrangement is left in each case to personal ingenuity."[6]

Because of Young's understanding of the extreme danger of the rigid rock belay, and the inability of anyone to suggest a means of protecting the leader that could do more than merely "lessen the chance of snapping the rope," he advocates reluctantly a conclusion that was later extended by Abraham and Brunning to an extreme that shocks many climbers.[7] They state, in effect, that the leader must at all times realize that his fall cannot be held by those below him, and that the probable destruction of the entire party makes it entirely unjustifiable for him to undertake the risk of a fall. Therefore, they conclude, if the leader should fall, he has knowingly violated his obligations to the rest of his party and *must therefore ruthlessly be sacrificed.* This sacrifice is to be accomplished very effectively; they frankly recommend that the second man use a static rock belay which would almost certainly result in breaking of the rope. Of course, the great controversy over the broken rope on the first ascent of the Matterhorn seventy years before, shows at least that general opinion then did not share such an extreme view. But that anyone should now urge sacrificing a leader illustrates the inability to devise any adequate means of protecting him.

The best writers have therefore merely concluded that since the static belay will not check such a fall, the leader simply "must not fall." Such advice is still the soundest from a preventive view but it is of little help once the fall has occurred.

A new approach to the problem was therefore taken in America. The fatalistic doctrine that "a fall from above cannot be held" was considered unacceptable; it was not logical to tie the members of a party together with a climbing rope unless each knew, from experience, the most effective means of using that rope in the event of any fall, a leader's included. The actual experience was important. George Abraham could state with pardonable pride that he had never fallen in thirty years of climbing;[8] but if his companions were equally competent, no actual experience would have been had by any of them in the practical application of their theories of holding a fall.

[6] Underhill, *op. cit.*, n. 3.

[7] Young, *op. cit.*, 1920 ed., pp. 260-263; 1945 ed., pp. 176 and 212.
Abraham, *op. cit.*, p. 155.
Brunning, *op. cit.*, p. 34.
——*Mtnrng. J.*, 1933, 1:4, p. 261.

[8] Abraham, *op. cit.*, p. 149.

A recent accident illustrates the need of that experience.[9] A leader had brought the second and the third persons on the rope up beside him, and the second person unroped to provide more rope. Although an experienced climber had previously suggested that it was always wise for the climber below to determine by careful test whether the belayer (in this case a girl) was actually prepared to hold a fall, the suggestion was rejected on the ground that the test *"might pull the girl off."* No test was made until the fourth person, while actually on the climb, fell. Just as predicted by those who had prevented a safe test to determine whether the girl had a practical and not merely a theoretical belay, the girl was "pulled off" into space. The leader, who had neglected the precaution of anchoring and protecting the girl, was caught by surprise and was also pulled off. He was killed, while others of his party were injured.

FALLS FOR PRACTICE

To recheck the theories of belaying, and to avoid the possibility of an accident such as that just described, each meeting of the rock-climbing section of the Sierra Club required some belaying practice by all participating. The belayer took a position on a ledge above a low overhang and was safely anchored there. Another climber, tied into the rope in normal fashion about ten feet below the belayer, would determine whether the belayer was ready by calling, "Test?" If prepared, the belayer would reply, "Test!" and the climber would slowly apply his full weight to the rope, finally swinging out clear of the overhang to show the belayer that he was actually holding a man's full weight. The next step was to increase gradually the severity of the fall by permitting increasing amounts of slack to develop before the climber stepped off the ledge beneath the overhang. The effect was as though a fall had occurred unexpectedly where the be- After further practice, unannounced falls were imposed upon the layer and the climber had carelessly permitted slack to accumulate. belayer. The force of such free falls was dramatically demonstrated to all concerned. The warnings of Preaker and Underhill about the great strength and skill required to check a fall were well appreciated.

The first falls were only a few inches onto soft prepared ground.

[9] Appalachian Mountain Club, New York Chapter, *"Report of rock climbing committee on accident at Arden,* Oct. 6, 1940," 9 pp. mim.

The belayer could not be torn from his stance because of the protection of the anchor. If the belayer dropped the climber no harm was done, for the climber was always prepared to absorb the shock by landing on his feet. The use of an overhang permitted falls of maximum severity with minimum height, and avoided the cuts and bruises of a fall down a face. It was soon found that different belaying techniques varied greatly in their effectiveness in checking a fall. The highly recommended shoulder belay was found to be the weakest of all. Few could hold a climber of their own weight on falls higher than two or three feet, even when using fifteen feet of rope. The extreme danger of having the rope run over the forward shoulder was clearly demonstrated, just as Underhill had warned. Nevertheless, such technique has frequently been advocated.[10]

The soundest of the body belays was the hip belay. This had previously been demonstrated in an excellent mathematical analysis by Dean Peabody of the Appalachian Mountain Club, and also by Young.[11] The experience accumulated in practice hip belays showed that in the standing position falls of four to five feet could be held. In the sitting position balance was so secure that with the length of rope being used, the practical limit of practice falls on a body belay was reached at about seven feet of slack. The pressure of the rope on the human body in absorbing the energy of such a fall became too great to accept in daily practice. Danger to kidneys and to the small of the back is particularly great. Fortunately, no alert team of climbers should ever be involved in a fall of more than seven feet with an upper belay. The results of such experiments strikingly emphasize that a pure body belay cannot be relied upon to stop a fall from *above* the belayer. Some other means must be found.

Since the limitations of the body belay had been so clearly demonstrated, experiments were commenced in 1934 with the new piton technique of Europe. An excellent booklet by Leo Maduschka in 1931 had been translated into several languages with profuse illustrations.[12] This furnished the basis upon which further study could be made. At the lip of a 30-foot overhang a piton was firmly driven into a narrow crack. Into the eye of this iron spike a steel carabiner

[10] *Mtnrng. J.*, Nov., 1934, 2:4, cover photo; Nov., 1935, 3:4, p. 203.
Brunning, *Rock Climbing and Mountaincering*, p. 30, diag. 14.
Peacocke, *op. cit.*, pp. 25 and 41.
[11] Peabody, Dean Jr., "Holding the rope," *Appalachia*, June, 1930, 18:1, p. 104.
[12] Maduschka, *op. cit.*, n. 3.

was inserted which permitted the climbing rope to run freely as though over a pulley. A convenient series of ledges on an 80-degree face near by permitted a gradual increase in the height of the clear fall. No difficulty was experienced with falls up to the seven-foot practical limit of the body belay. This was true whether the fall was from below the belayer or from three and one-half feet above the piton. In each practice fall, if the piton were at or above the waist of the belayer, the rope could be moved from the vulnerable small of the belayer's back to the relatively tough buttocks. This was possible because the pull would always be upward. At this stage (and even earlier), in order to protect the back and the ribs of the person falling, the bowline was changed to a bowline on a coil and shifted to the buttocks, forming a sitting sling; the faller's feet were held in readiness to take up the shock if the belayer should fail to hold. Certain advantages of the piton belay were already apparent. With a pure body belay a slip by the climber, even without a free fall, would impose a maximum load of double his own weight upon the belayer's knees.[18] If the fall were from a traverse, or if for other reasons the climber could not quickly be lowered to safety after the fall was stopped, the climber's weight upon the belayer would soon bring about collapse. With a piton belay, however, such a slip is comfortably held, so far as the belayer is concerned, merely by his sitting in the loop of the belaying rope. If lowering is inadvisable the rope can be anchored to the piton, and he is free to work out the rescue. Hence, so far as these factors are concerned, a piton belay is sounder than a body belay with a piton anchor.

That same advantage of balance of weight over the piton becomes somewhat of a liability, however, in higher falls. If friction over the carabiner is disregarded for the sake of making a clear example, the kinetic energy of a climber falling from above would lift a belayer of equal weight into the air the same distance that the climber fell. They would come to rest entirely helpless in midair. It is therefore important that the belayer be anchored by the third man, or by a rock anchor, piton, or a firm handhold. Surprising as it may seem, a ten-foot fall can easily be held by only one hand if proper technique is used.

It is the *dynamic belay* that permits such a remarkable advance in

[18] If there is no slack between belayer and climber at the moment the climber falls, the distance he will drop will be equal to the stretch of the rope. Hence the load in the rope will mount to twice the weight of the climber as shown by the equation: $WH = \frac{1}{2}PX$; where W = weight of the climber; H = height of fall; X = stretch of the rope; P = load. Then, if $H = X$, $W = \frac{1}{2}P$, or $P = 2W$.

the technique of checking a high fall. If a falling body is stopped infinitely quickly the force required or generated would be infinitely great. If the fall is checked very quickly the force required would be very great; and if it be checked slowly, the force required would be small. Hence, if the climbing rope is allowed to slide over the belay point, the kinetic energy of a high fall can be checked by a force that is small enough for both belayer and climber to withstand. Only by permitting the rope to slide could a belayer hold 7-foot falls with the body belay. With the combination of piton technique and the dynamic belay, falls of 18 feet were repeatedly held on 40 feet of Manila rope. Even higher falls could be held, but were never attempted. Since even an 18-foot fall required a deliberate jump from the lip of a 30-foot overhang, the dangers involved should anything go wrong made it seem unwise to attempt higher practice falls once the technique had been so thoroughly worked out. Moreover, it is normally possible to place pitons at approximately 10-foot intervals when the risk is great, and thus be within experimental limits, or else to realize the full dangers if such protection is not possible. A safe technique for practice of higher falls is possible by use of an inanimate dummy, but it has not been frequently used owing to the time and trouble required to prepare it for each fall.

The development of the dynamic belay has been sketched in some detail in order to permit other groups to use the same technique in training. Brief accounts had previously been published in *Appalachia* and in the *Sierra Club Bulletin*.[14] So much for the practical development of an improved technique in the art of mountaineering.

With the coming of war a wealth of information of great value to mountaineers was developed which had never before been available to them. When the United States suddenly found itself at war with two major powers, each of which had competent mountain troops, all the knowledge of organized mountaineering was applied to the task of furnishing the 10th Mountain Division with the finest technique and equipment available to the world. It was truly a United Nations effort, with the principal mountaineering organizations of Great Britain, Canada, and the United States coöperating with the scientific facilities of the National Bureau of Standards of the U. S. De-

[14]Leonard, Richard M., "Piton technique on the Cathedral Spires," *Appalachia*, Dec., 1934, 20:9, p. 178.
——"Values to be derived from local rock climbing," *S.C.B.*, 1934, 19:3, p. 28.
Harris, Morgan, "Safety Last?" *S.C.B.*, 1942, 27:4, p. 71.

partment of Commerce, the Massachusetts Institute of Technology, and the laboratories of the Plymouth Cordage Company. How was that new information applied to the practical techniques already available?

THE FIVE LINKS OF THE BELAYING CHAIN

In final analysis the technique of belaying is a chain of factors no link of which must fail. What are the capabilities and limitations of each link—the human body (of both climber and belayer), the climbing rope, the carabiner, the piton, and the rock, snow, or ice supporting the belay point.

The human body is a remarkable paradox, fearfully delicate and yet amazingly indestructible. Hugh De Haven, of the Medical College, Cornell University, has made a most interesting analysis of the facts of survival of several nonmountaineering falls of great height.[10] By careful analysis of the distance within which each of the falls was checked it was determined that the human body frequently had survived forces equal to two hundred times the force of gravity. For instance, if a person falls 200 feet and his kinetic energy is absorbed at a uniform rate over a distance of two feet (assuming that the medium absorbing the energy is elastic), there is a chance for survival if the force is absorbed equally by all parts of the body. The most extreme case recorded in the study is that of a woman who attempted suicide from the seventeenth floor of a building and survived a fall of 144 feet onto a metal ventilator which collapsed under the blow. Survival in extremely high falls on steep snow or ice is common where a gradual stop is possible. Examples are the 500-foot fall of Jessie Whitehead on Mt. Washington[11] and the 1900-foot fall of Ernst Krebs on the Grosse Weisbachhorn.[11] On the other hand many hundred people a year are killed by falls of only a few feet in bathtubs or on sidewalks—"It's not the fall that hurts; it's the sudden stop." The stop may be so sudden that a force of well over 200 times that of gravity is concentrated on the head, with resulting death of the victim.

Survival under such high force is possible only if the force is ab-

[10]DeHaven, Hugh, "Mechanical analysis of survival in falls from heights of 50 to 150 feet," *War Medicine*, July, 1942, vol. 2, pp. 586-596.

———"Mechanics of injury under force conditions," *Mech. Engineering*, Apr., 1944, 66:4, pp. 264-268.

[11]Local ice climbing." *Appalachia*, June, 1933, 19:3, p. 456.

[11]"The accident on the Grosse Weisbachhorn," *Alpine J.*, Nov., 1932, 44:245, p. 348.

sorbed about equally by all parts of the body, a rare happening in a mountaineering fall. Both the climber and the belayer are unfortunately subjected to a concentration of the force along the narrow line of one or two turns of 7/16-inch rope. Thus if it were possible for the force of a mountaineering fall of a man weighing 175 pounds to be one-fifth of the maximum that the body can stand, say a fall of 20 feet checked in ½ foot on a nonstretchable rope, the concentrated force on the bodies of both climber and belayer would be equivalent to the static pressure of a 3½-ton guillotine with a 7/16-inch edge. The climbing rope would, however, snap and severe injury would probably result anyway. But if that same 20-foot fall were checked gradually over a distance of 10 feet with a dynamic belay, the maximum force would be only about 350 pounds, a force too small to injure.

It is thus clear that a fall should always be checked as gradually as practicable, preferably in about half the distance of the fall. Fortunately, in most mountaineering falls, the bodies of climber and belayer will in themselves have almost enough resiliency to keep the force within safe limits even if the fall is inexpertly and rigidly held. The "give" of the climber's body and rope loop amounts to about nine inches. The belayer's body gives another nine inches. These figures are based on the rigid belay of a climber hanging as a dead weight. Under the shock of a fall the resiliency of body and bowline loop would increase at a diminishing rate until finally they would be insufficient by themselves to keep the force within safe limits. They are, however, deceptively important on low falls, and thus the dangers of a rigid belay are frequently never disclosed to one who has held only low falls. If four times the force of gravity be considered an entirely safe force for the body to withstand and ten feet of rope is in use, a fall of a little more than three feet would be checked by the body and rope resiliency alone, with a static body belay being used. On such low falls no sliding of the rope is therefore necessary, although still advisable. In addition, falls that might otherwise have resulted in serious injury owing to a rigid static belay have been frequently checked by the falling man's grasping of the rope and passing handholds, by the friction of his falling body against the rock, and finally by the ability of his legs to absorb heavy shock on landing. All these factors have combined to give a false sense of security in the holding of falls.

The climbing rope is the next link. In the search for the finest possible rope for the U. S. Mountain Troops every available fiber suitable for rope was analyzed (but because of the war, flax and Italian hemp were not available). The results are presented in table 1. The important characteristics of the ideal climbing rope are listed with the performance of each fiber. Table 2 gives the comparative performance of the principal fibers with Manila abaca being used as a standard at 100 per cent. The superiority of nylon is strikingly apparent. It was on the basis of those studies that approximately two million feet of nylon rope was procured for the Mountain Troops.

A climbing rope must have both strength and stretch in proper balance. Neither is the controlling factor. This has been recognized in the mathematical analyses in the various mountaineering alpine journals. A 7/16-inch high-grade steel cable is rated as being capable of sustaining a dead weight of 14,000 pounds. There is however no value in having so high a strength—the person falling would be crushed long before the breaking point of the cable was reached. The same is true of any rope material; the breaking strength need not exceed the maximum concentrated force that the body can stand, plus a reasonable factor of safety to allow for aging of the rope. Thus, even while acknowledging that 7/16-inch Manila rope could not stop the fall of the leader on a rigid belay, mountaineers throughout the world have agreed on 7/16-inch diameter as being a reasonable compromise of breaking strength versus weight and ease of handling. Owing to the great breaking strength and stretch of nylon, 3/8-inch rope was tried, to save approximately 25 per cent in weight. It was found, however, that although strength was adequate, the diameter was too small for comfort of climber and belayer. In the practice falls and belays of the Sierra Club, ½-inch Manila is used for greater ease in teaching belaying since weight is unimportant. The larger diameter also gives a greater factor of safety to compensate for the severe wear caused by such extreme treatment.

It is thus clear that maximum breaking strength is not essential. Neither is maximum stretch even desirable. A person falling on a rubber rope with an elongation factor of several hundred per cent could easily strike a ledge below with damaging force before enough of his kinetic energy had been absorbed by the rope. On the other hand, if there is no elongation of the rope, an extremely heavy force

TABLE 1

QUANTITATIVE DATA ON PERFORMANCE OF CLIMBING ROPE[1]
(7/16-INCH DIAMETER; 0.0500 LB/FT WEIGHT)

TEST	UNIT		MANILA ABACA[17]	HIGH-ELONGATION NYLON[19]
Breaking strength[2]	lb	Dry	2500	3010
	lb	Wet	2620	2460
	per cent of dry	Wet	105	82
Elongation at failure[3]	per cent	Dry	12	73
	per cent	Wet	19	70
Strain energy[4]	ft. lb./ft	Dry	100	732
	ft. lb./ft	Wet	167	574
	per cent of dry	Wet	167	78
Abrasion over rough bar[5]	per cent of original breaking strength	Dry	64	
Abrasion over smooth bar[6]	number of cycles	Dry	11,000	....
Flexing over pulley[7]	number of cycles	Dry	41,000	....
Strength over carabiner[8]	per cent of breaking strength	Dry	50	67
Square-knot strength[9]	per cent of breaking strength	Dry	50	60
	per cent of breaking strength[10]	Wet	58	58
Weathering[11]	per cent of original breaking strength	Dry	60	
Water absorption[12]	per cent	Wet	57	....
Exposure to extreme heat[13]	per cent of original breaking strength	Dry	58	....
Exposure to freezing[14]	per cent of original breaking strength	Wet	100	....
Exposure to subzero temperature[15]	per cent of original breaking strength	Dry	100	....
Actual diameter tested	in	Dry	7/16	3/8
Actual weight tested[16]	lb./ft	Dry	0.0503	0.0400
Actual breaking strength	lb	Dry	2510	2410
	lb	Wet	2640	1970

FOOTNOTES TO TABLE 1

[1]*Caution.* Rope-construction methods result in strength variation within the same length of rope as high as ten per cent. Hence the figures given cannot be considered precise, and small differences are only indicative. Since the data were obtained on rope of different diameters, equivalent strength values were computed for 7/16 rope having a nominal weight of 0.050 pounds per foot in order to permit a comparison among the various fibers on the same basis. To do this, the assumption was made that the strength of a rope is directly proportional to its weight per unit of length.

[2]Maximum load required to break a standard rope specimen with spliced ends in a testing machine with the heads separating at the rate of four inches per minute.

[3]The elongation of the free length of a standard rope specimen at the instant of failure, expressed as a percentage of the free length under no load.

[4]The energy absorbed by a unit length of rope on first loading up to the instant of failure. Theoretically this is the area under the load-elongation curve. It is closely approximated by 1/3 of the product of the breaking strength and the unit elongation at failure, and has therefore been so computed.

[5]Breaking strength of abraded rope expressed as a percentage of the breaking strength of new rope. Abrasion consisted of 12- to 14-inch travel of the rope over approximately 140° of a 1.3-inch diameter rough cast iron bar for 25 cycles (up and down), sizing and loose fibers being removed at the end of the tenth and the twentieth cycles.

[6]Number of cycles that produced failure in the rope. Abrasion consisted of 39 cycles (each cycle was equal to two 12-inch strokes) per minute over a 1½-inch diameter water-cooled smooth steel pipe, the angle of contact of the rope with the surface of the pipe being about 135°.

[7]Number of cycles that produced failure in the rope, this being a test of the resistance to flexing and internal resistance. Flexing consisted of 34 cycles (each cycle was equal to two 8¼-inch strokes) per minute over a 1¾-inch diameter steel ball-bearing roller with 40-pound weights suspended from the ends of the rope and no slippage between roller and rope. The angle of contact was about 175 degrees.

[8]The breaking strength of rope over a ¾-inch carabiner, expressed as a percentage of the breaking strength of free rope.

[9]The breaking strength of two sections of rope joined by a square knot, expressed as a percentage of the breaking strength of free continuous rope. This shows the efficiency of the knot. See table 4 for the strengths of other knots.

[10]Same as n. 9, but breaking strengths of wet knotted rope and wet free rope compared.

TABLE 1, *Continued*

Quantitative Data on Performance of Climbing Rope[1]

(7/16-inch diameter; 0.0500 lb/ft weight)

Manila Abaca[17]	High-elongation nylon[19]	Clothesline nylon[20]	Pre-set nylon[21]	Monofil nylon[22]	Braided nylon[23]	Rayon	Saran	Cotton	Jute	Beale's Manila[24]	Frost's Italian hemp[24]	Frost's English flax[25]
2500	3010	2600	2720	3300	2480	1710	1070	1660	1140	1950	2240	2181
2620	2460	2210	2700	2630	2050	840	1170	....	....	....	....	....
105	82	85	99	80	83	49	109	....	....	....	....	....
12	73	45	37	51	42	....	26	15	13	16	9	16
19	70	....	....	49	41	....	....	....	....	....	....	....
100	732	390	335	561	347	....	93	83	49	104	67	116
167	574	....	....	430	280	....	....	....	....	....	....	....
167	78	....	....	77	81	....	....	....	....	....	....	....
64	....	99	100	0[27]	58	....	....	....	....	....	....	....
11,000	....	....	....	....	....	....	....	....	....	....	....	....
41,000	....	....	....	....	....	....	....	....	....	....	....	....
50	67	63	62	70	62	....	....	....	....	....	....	....
50	60	69	65	53	65	....	....	....	....	....	....	....
58	58	....	....	57	....	....	....	....	....	....	....	....
60	....	....	....	....	....	....	....	....	....	....	....	....
57	....	43	18	....	47	....	....	....	....	....	....	....
58	....	....	....	....	....	....	....	....	....	....	....	....
100	....	....	....	....	....	....	....	....	....	....	....	....
100	....	....	....	....	....	....	....	....	....	....	....	....
7/16	3/8	3/8	3/8	3/8	7/16	1/4	23/64	1/4	1/2	7/16	7/16	3/8
0.0503	0.0400	0.0350	0.0430	0.0345	0.0580	0.0190	0.0465	0.0194	0.0725	0.0561	0.0463	0.0437
2510	2410	1820	2340	2280	2780	650	1000	645	1650	2190	2060	1904
2640	1970	1545	2320	1815	2360	320	1090	....	....	....	....	....

[17]Breaking strength of rope exposed to 9 months of Florida sun and rain, expressed as a percentage of the breaking strength of new rope.

[18]The weight of water absorbed per pound of rope after immersion in water for 24 hours, expressed as a percentage of the increase in weight over the dry weight. In Table 2 this has been expressed as a reciprocal to show resistance to wetting.

[19]Breaking strength of rope exposed for two hours to 175° F. and tested immediately after exposure, expressed as a percentage of the breaking strength of rope under standard conditions.

[20]Breaking strength of rope soaked in water for one hour and then exposed to freezing at 32° F. for 24 hours and tested, expressed as the percentage of unfrozen wet strength.

[21]Breaking strength of rope exposed to −40° F. for 5½ hours and tested immediately after exposure, expressed as a percentage of the breaking strength of rope under standard conditions of 72° F. and 65% relative humidity.

[22]The natural weight of rope in pounds per foot, determined by weighing a 10-foot length of rope. The weight given is the weight of the rope actually tested.

[23]"Balloon Rope," 3-strand, with a better grade of abaca fiber and different construction than common Manila rope and hence stronger per pound of fiber.

[24]A 3-strand rope with a backturn-resistant construction made from Type 300 bright multifilament nylon yarn. This was the type adopted for the U.S. Army and is now available commercially through Plymouth Cordage Co., North Plymouth, Mass.

[25]This is a 3-strand laid rope of a specially treated multifilament nylon yarn. More extreme types, up to 100 per cent elongation, were also tested.

[26]To avoid backturning and raveling, type 300 multifilament nylon yarn was woven into the same type rope as cotton clothesline.

[27]To furnish a stiffer rope, free from backturning, and to increase resistance to abrasion, type 300 multifilament nylon rope was treated (probably by boiling).

[28]For the same purpose, a rope was laid in three strands from 4-mil monofilament nylon fiber, a very coarse fiber. The lack of resistance to abrasion was amazing.

[29]To avoid kinks and to furnish more surface friction for belaying, a rope was woven in a rectangular plaited fashion from multifilament nylon. Note the great loss in tensile strength.

[30]"Report on rope: Tensile tests," *Alpine J.*, Nov., 1931, 43:243, pp. 325-329.

[31]Young, *Mountain Craft*, 1920 Ed., p. 93.

[32]Average of many tests, computed as a percentage relationship to dry nylon.

[33]Failed after 20 cycles.

TABLE 2

COMPARATIVE PERFORMANCE OF CLIMBING ROPE WITH MANILA AS STANDARD

TEST		MANILA	SISAL	MOUNTAIN NYLON	HIGH-ELONGATION NYLON	NYLON	MONOFIL NYLON
Tensile strength	Dry	100	73	147	120	89	132
	Wet	100	68	115	94	70	100
Elongation at failure	Dry	100	103	458	608	38	418
	Wet	100	113	316	368	..	258
Strain energy	Dry	100	73	675	732	35	561
	Wet	100	75	362	333	..	258
Abrasion over rough bar	Dry	100	....	113	....	36	0
Abrasion over smooth bar	Dry	100	....	1982	....	..	....
Flexing over pulley	Dry	100	....	1508	....	..	....
Carabiner strength	Dry	100	137	160	141	25	140
Square knot strength	Dry	100	101	127	120	90	106
	Wet	100	105	120	100	..	98
Weathering	Dry	100	....	113	....	..	....
Resistance to wetting	Wet	100	....	197	....	16	....
Exposure to extreme heat	Dry	100	134	149	....	..	....
Exposure to freezing water	Wet	100	100	91	....	..	....
Exposure to subzero temperature	Dry	100	105	102	....	..	....

would result from the check of a rigid belay, resulting in fatal crushing of the climber or snapping of the rope. Thus again a practical compromise must be made. A high quality Manila rope will have an elongation of 12 to 18 per cent as against 37 to 55 per cent for nylon mountain rope, and 75 to 100 per cent for high-elongation nylon rope. These figures indicate the amount that the rope will have stretched when its breaking point is reached. The relative stretch for equal tensions will be approximately in proportion to the maximum elongation at the breaking point divided by the breaking strength. That is, the two types of nylon rope will stretch about three and five times as much as Manila when subjected to the same tension. Although on the first fall the high-elongation nylon will absorb more energy than the types with a lower factor of elongation, the practical problems of checking a fall where the climber stretches the rope five times as much as normal, have prevented the adoption of that amazing fiber. Moreover, the advantage is lost after the first severe strain, and there are important production difficulties at the present time. Further research is nevertheless desirable.

TABLE 2—*Continued*

STANDARD COMPARATIVE PERFORMANCE OF CLIMBING ROPE WITH MANILA AS STANDARD

HIGH-ELONGATION NYLON	NYLON	MONOFIL NYLON	BRAIDED NYLON	RAYON	SARAN	COTTON	JUTE	BEALE'S MANILA	FROST'S ITALIAN HEMP	FROST'S ENGLISH FLAX
120	89	132	99	68	43	66	46	78	90	87
94	80	100	78	32	45	....	....	....	....	....
608	88	418	344	....	215	125	107	130	74	133
368	..	258	215	....	....	....	....	....	....	....
732	85	561	347	....	93	83	49	104	67	116
333	..	258	168	....	....	....	....	....	....	....
....	56	0	91	....	....	....	....	....	....	....
....	..	....	....	....	....	....	....	....	....	....
....	..	....	....	....	....	....	....	....	....	....
141	95	140	125	....	....	....	....	....	....	....
120	80	106	129	....	....	....	....	....	....	....
100	..	98	....	....	....	....	....	....	....	....
....	..	....	....	....	....	....	....	....	....	....
....	86	....	121	....	....	....	....	....	....	....
....	..	....	....	....	....	....	....	....	....	....
....	..	....	....	....	....	....	....	....	....	....
....	..	....	....	....	....	....	....	....	....	....

The combination of breaking strength and elongation of a rope provide the resiliency or "strain energy" of the rope that enables it to absorb a considerable portion of the kinetic energy of a fall. Strain energy is far more important than breaking strength as an indicator of the relative value of ropes in checking a mountaineering fall. The strain energies referred to in tables 1 and 2 are calculated empirically.[18] While lengthy computations of the areas beneath the load-elongation curves or detailed impact tests would give more precise quantitative results, the tables are accurate from a qualitative or comparative view. Nylon fiber is superb with respect to strain energy. Table 1 shows that a 10-foot length of new 7/16-inch mountain nylon, with an elongation of 55 per cent to the break, will absorb about 6,750 foot-pounds of kinetic energy. That is equivalent to a 265-pound rigid mass falling freely 20 feet onto a rigid belay and

[18] The energy absorbed by a unit length of rope up to the instant of failure is, theoretically, the area under the load-elongation curve (see table 3). It is closely approximated by one-third of the product of the breaking strength and the unit elongation at failure, i.e., $E = 1/3\ PX$. If rope were truly elastic, that is, if rope obeyed Hooke's Law, then one could use the well-known formula $E = \frac{1}{2}\ PX$. However, rope is usually not elastic, as the curves in table 3 show; instead of straight lines, the load-elongation curves are parabolic.

stretching the 10-foot length of rope 5.5 feet to its breaking point.

It was realized that such energy values derived from data obtained from the slow-moving heads of the testing machine might not agree with the energy absorption ability of the rope under the sudden shock of the fall of a climber under the acceleration of gravity. A careful impact test was initiated at the Bureau of Standards. A rigid mass fell free upon a rigid belay from a height above the belay point equal to the length of the rope used in the test—a fall of twice the length of the rope, the most severe fall possible. The ropes used were 7/16-inch 3-strand Army mountain nylon and 9/16-inch 4-strand sisal. Detailed figures and graphs are given by the Bureau of Standards.[19] Adjusting the figures for 9/16-inch sisal so that they are roughly equivalent to 7/16-inch sisal, one is startled to find that an approximate weight of only 75 pounds would be sufficient to snap one or more strands of 7/16-inch sisal rope in a 10-foot fall. Worse yet, on a 20-foot fall a 63-pound weight would snap the rope.[20] Manila fiber was not available for test but cannot be expected to be more than 25 per cent better. Nylon rope on the other hand is greatly superior. A weight of 278 pounds was required to break the rope on a 10-foot fall and, amazingly, 298 pounds were needed on a 20-foot fall. This shows approximate efficiencies of 370 per cent and 470 per cent for nylon in comparison to sisal. Nylon is the only known fiber that will enable a 7/16-inch climbing rope to hold the fall of a climber on a rigid static belay. Since the maximum force developed in so checking a fall of twice the length of the rope is about 14 times the weight of a climber (2440 pounds for a 175-pound man), the dynamic belay is still needed to reduce that force to a minimum.

Many mathematical mountaineers had insisted that resiliency was entirely independent of the height of fall. That is, if 10 feet of rope would sustain a weight on a 10-foot fall, 20 feet of rope would hold the same weight on a 20-foot fall. The experimental results are divergent, apparently dependent upon the type of fiber, but are in close enough agreement to confirm the theory within reasonable limits of experimental error. A difference of 100 per cent in height of fall made a difference of only 10 per cent in the weight

[19]Newman, Sanford B., and Helen G. Wheeler, "Impact strength of nylon and of sisal ropes," *J. of Research of the Nat. Bureau of Standards*, Washington, 1946, 35:5, Research Paper No. 1679, pp. 417-431.

[20]The actual figures for 9/16 sisal are 142 pounds on the 10-foot fall, and 122 pounds on the 20-foot fall.

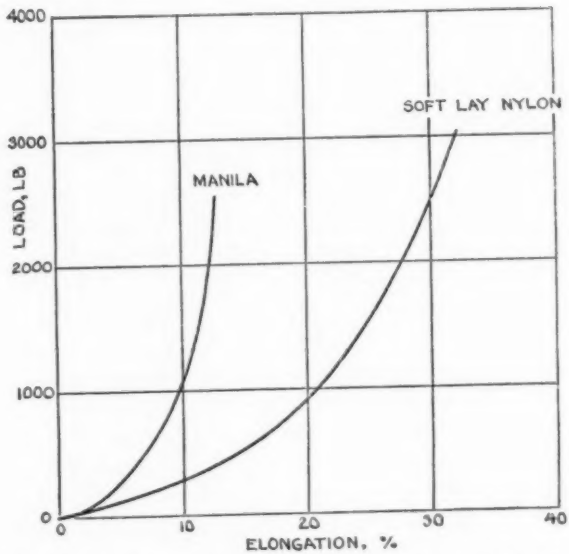


Fig. 1 Typical load-elongation curves for 7/16-in. diameter climbing ropes.

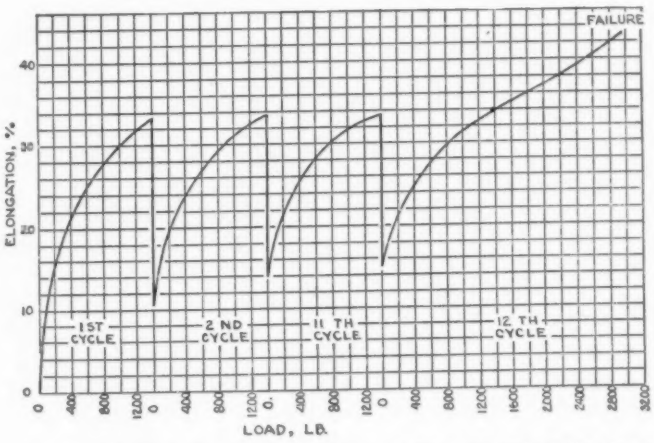


Fig. 2 Repeated loading of ⅜-in. diameter nylon rope, each loading to 50 per cent ultimate tensile strength, 5-minute recovery between cycles.

sustained, and that was in opposite directions for the two fibers. These results are inconclusive and more experimenting is desirable.

It must be clearly understood that a large portion of the resiliency or energy-absorption value of a rope may be destroyed by a single severe strain. That is because no rope is fully elastic. In other words, once a rope is severely stretched, part of that valuable elongation is permanently lost. Figure 2 shows a typical load-elongation curve of nylon under repeated loading to 50 per cent of breaking strength. On the very first load one-fourth of the elongation is permanently lost, but will have been available and extremely valuable in checking the first severe mountaineering fall. If a rope has once undergone a strain of half its breaking strength, appropriate precautions should thereafter be taken. Nor should one follow the old advice of "wetting a new rope and stretching it tightly between two trees to make it soft and nice to handle." To do so will destroy a large portion of the available elongation and hence the resiliency, leaving the rope "soft," but lifeless and dangerous as well. The same effect comes about through use of the rope and exposure to abrasion and the elements; hence a used rope is far weaker than its breaking strength would indicate. Periodic tests on sisal, Manila and nylon ropes over a period of from 2 to 4 years of good storage showed, however, no significant change in tensile strength, and only slight loss in the factor of elongation.

A limitation on rope strength is the weakness of all knots. Table 3 shows the relative breaking strength of several common mountaineering knots. It will be seen that they retain from only one-half to two-thirds the strength of the rope. While the force required to break a new rope at the knot is so great that the climber would be severely injured anyway, it is conceivable that the weakness of a poor knot might be the point of failure of an old rope. However, no climbing rope is known ever to have broken at the knot in the field. In the use of very light line for roping down, the strength of the knot can be quite important. This is shown by the loads on the rope that have actually been measured in belaying and rappelling. In a sudden check of a 10-foot fall on a 40-foot rope a load of 1,250 pounds was recorded. On jerky rappels loads as high as 500 pounds were revealed. Such recorded loads indicate why the rope has failed on many occasions in both belaying and rappelling.

The carabiner is the next link in the belay chain. Some light

TABLE 3

COMPARATIVE EFFICIENCIES OF KNOTS IN ROPE

KNOT	EFFICIENCY	
	5/16-IN. MANILA PER CENT	1/4-IN. NYLON PER CENT
For tying ropes together:		
Double carrick bend	65	71
Weaver's knot (sheet bend)	68	65
Double weaver's knot	61	62
Fisherman's knot	63	59
Bowline hitch	60	57
Square knot	62	54
Single carrick bend	..	53
For end man (strain between loop and standing part):		
Double bowline	..	69
Bowline	..	65
Fisherman's noose or eye	..	62
For middle man (strain between loop and standing part):		
Butterfly	64	..
Fisherman's noose or eye	54	..
For middle man (strain between the two standing parts, not on loop):		
Butterfly noose	..	63
Fisherman's noose or eye	..	58
Overhand loop	..	49

Swiss carabiners have been dangerously weak, a load of only 600 pounds bending them open. An Austrian type of twice the weight had a reasonably satisfactory strength of 2,175 pounds with the link closed, but only 1,070 pounds with the link open. In order to overcome such general weakness the Germans added a threaded collar to close the point of contact of the hinged catch. The advantage was more psychological than real, for the weak points were still the hook and the hinge pin at opposite ends of the catch. Moreover, the threaded collar, while preventing accidental opening of the carabiner, interfered seriously with its free use.

American mountaineers realized that with proper metallurgy even an open "C" of the same weight could sustain as high a load as any climbing rope could stand; but with a market of only a hundred or so carabiners a year, no American manufacturer could undertake production. Fortunately for the peacetime sport

of rock-climbing, the war partly solved that problem. A redesign of the catch of the lip permitted mass production with increased strength. That, with the use of 4130 steel, provided the Mountain Troops with carabiners of the same weight as the light Swiss type, but with a strength of 2,200 pounds as against 600. At the close of the war a much lighter type was developed from 24 ST aluminum alloy. It weighs only 2¼ ounces as against 4¼ ounces for the standard type, and yet has a static strength of 2,000 pounds.

There is no value in a carabiner of greater strength than the standard army steel type, for the human body would not be likely to survive that severe a shock. Moreover, the rope is severely strained in passing over the ⅜-inch rod of the army carabiner. When ropes of various fibers were broken over a rod of that diameter, Manila had only 50 per cent of its original strength and nylon only 79 per cent. That is a serious loss of strength, and is vividly demonstrated by the shower of outer fibers of a Manila rope when, in checking a high fall, they burst in passing over the carabiner. To reduce the damage to the rope, the army aluminum carabiner was made of 7/16-inch rod of nearly equal strength but less weight. Several ropes have snapped in practice piton belaying, so it is very important that only rope of excellent quality and in good condition be used whenever a high fall is possible. The carabiner catch should always be away from the rock, for the pressure of a fall may otherwise force the carabiner against a knob of rock and open the catch.

The piton comes next in the chain. The design was so simple that the local blacksmiths of Europe and America could and did produce them. The result was a dangerous variation in quality. Some purchased from leading dealers in Munich varied from a static strength of only 1,625 pounds up to 4,500 pounds. Some were so brittle that they would snap like cast iron under impact. Others were so soft and malleable that they could not be driven with force into a firm crack. Accordingly, for the Mountain Troops, the basic design of the German horizontal and vertical pitons was modified a bit to provide greater structural strength (fig. 3). The ice piton was redesigned as a tube that would be much lighter and yet far stronger in ice. Finally a new piton was designed of ⅛-inch sheet steel bent at a 60-degree angle along its length, a light weight piton for use in wide cracks and unsound rock (fig. 3); the com-

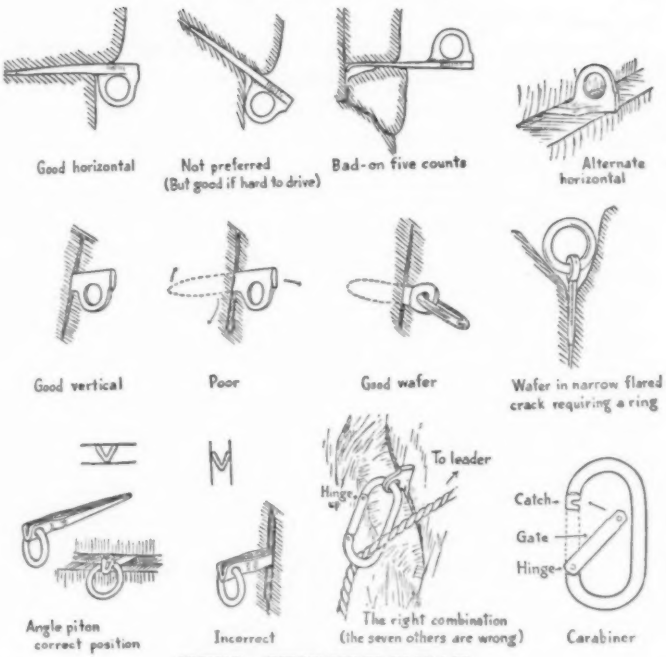


FIGURE 3. PITON TYPES IN PLACE.
(Adapted from *Manual of Ski Mountaineering.*)

pression or expansion of its angle provides so uniform a grip along the sides of the crack that it is now the strongest of all piton types. At the same time careful study was made of the metallurgy and heat treatment required to provide maximum strength and toughness in commercially available metals. Low-carbon 1010 steel, with suitable heat treatment after forging, was decided upon. The army horizontal, vertical, and angle pitons withstood a pull through the eye perpendicular to the axis of the blade which exceeded 3,000 pounds without breaking or showing signs of a crack. The eye deformed under load but this did not result in failure. The wafer piton behaved similarly under a load of 2,000 pounds.

The rock, snow, or ice supporting the belay point is the final link in the chain. Until wartime research was undertaken, few facts were known about the actual strength of a piton in rock or ice. With the coöperation of expert climbers from all sections of the United

States, the Bureau of Standards conducted careful tests in the field. The rocks chosen for the tests were hard metamorphosed schists along the Potomac River. All persons present were agreed that although they had encountered better rock, the strength of the cracks tested seemed to be above the average found in mountaineering. Each type of piton was carefully driven into the most appropriate crack available. By means of block and tackle, increasing load was placed upon the piton in the direction a fall would take. The load was carefully recorded by means of a ring dynamometer. Any rock-climber who has done much piton work, particularly removing pitons as a climb progresses, is well aware of the extreme variation in the reliability of individual pitons. This was confirmed by the tests (see table 4). The maximum grip upon

TABLE 4

HOLDING POWER OF PITONS IN ROCK CRACKS

TYPE OF PITON	DIRECTION OF LINE OF PULL	MAXIMUM LOAD (in pounds)
Horizontal	Parallel to eye and perpendicular to axis of the blade, No. 1	1350
	No. 2	1425
	No. 3	1850
	Perpendicular to and away from eye and inclined 45° to axis of the blade	775
	Parallel to eye and inclined 135° to axis of the blade	1025
	Parallel to crack and parallel to axis of the blade	325
Vertical	Perpendicular to eye and perpendicular to axis of the blade	600
	Parallel to eye, axis of the blade, and crack	1225
Wafer	Perpendicular to ring and parallel to axis of the blade	625
	Parallel to eye, axis of the blade, and crack	625
Angle	Parallel to legs and perpendicular to axis of the blade	1325
	Parallel to and away from legs and perpendicular to axis of the blade	1350
	Parallel to legs and inclined 35° to axis of the blade	2200

the horizontal piton was 1,850 pounds; the new angle piton reached a maximum of 2,200 pounds. Further research is badly needed.

By similar technique the new tubular ice piton, 5/8-inch outside

diameter, was found to withstand a pull of about 2,000 pounds in a direction parallel to the tube. A 600-pound load parallel to the surface of the ice produced no appreciable permanent set in the piton. For the experiment water ice was used at a temperature of 10 to 20 degrees Fahrenheit. The piton was driven in until the ring was two inches from the surface of the ice. No experiments could be conducted on compacted firn snow or on glacial ice. Again, research is badly needed concerning belays on snow and ice, where the analytical approach is fully as essential as on rock. Preliminary experiments of the Sierra Club indicate that all types of belays recommended for snow and ice are far weaker than seems generally to be realized.[21]

The question may well be asked, if the piton varies so in its attachment to rock, why isn't the classical rock belay better? The strength of a good rock belay would be very valuable if it were practicable each time to use it as a point of suspension for a carabiner hanging from a sling of rope. But few rock belays are so fortuitously formed as to avoid cutting or jamming the climbing rope, or permitting it to jump off the belay point during the somewhat unpredictable course of a fall from above. Nor can even experienced climbers always determine the strength of rock belays. The May, 1944, *Alpine Journal* cites the death of a Chamonix guide, stating, "It appears that a rock belay came loose, thus causing Cachats' fall."[22] The real answer lies in the experience of nearly a century of British climbing, which resulted in the conclusion that a fall from above could not be held on a rock belay. This is because the "strength" of a rock belay is really its greatest weakness. It permits, encourages, and sometimes even forces a relatively rigid belay that will develop loads far greater than the other links in the chain can stand. Nevertheless, all climbers must realize that the variable holding power of a piton in the rock requires full use of the dynamic belay to reduce to a minimum the load on each of these links. Whenever a well-formed rock belay is smooth enough or can be padded so as to be safe for use as a dynamic belay, it should of course be used. Unfortunately, rock belays adequate to hold a fall from above are all too scarce.

In part to overcome this scarcity, but primarily to provide safety

[21]See discussion on the fatal fall of the four Eton masters in "The accident on Piz Roseg," *Alpine J.*, Nov., 1933, 45:247, pp. 414-418, and May, 1934, 46:248, pp. 259-274.

[22]"Fatal accidents," *Alpine J.*, May, 1944, 54:268, p. 316.

where good piton cracks are not available, a commercial anchor has recently been adopted by mountaineers. It is the expansion bolt, consisting of two metal sleeves that expand as the eye bolt is screwed into a wide crack or hole that has been drilled for it. When made of the proper grade of steel, the bolt in its hole is reputed to be far stronger than any piton. It has particular advantage as a powerful belay point close by the belayer in situations where a long and delicate lead is necessary. It makes the climb no easier—placing one, even on a flat ledge, is a long job—but it permits a lead in safety that might otherwise be quite unjustifiable owing to the belayer's inability to hold a possible fall.

THE TECHNIQUE OF THE DYNAMIC BELAY

Having learned the limits of each link of the chain of belaying, we should next determine the particular technique that will keep the forces of a high fall within those limits. The maximum load under impact (in pounds) that each link can be expected to withstand, expressed in terms of static load, is:

The human body	1,750
7/16″ Manila rope (over carabiner)	1,250
7/16″ nylon rope (over carabiner)	3,000
Carabiner	2,000
Piton	3,000
Rock crack	2,200

Strength and experience is required of the belayer if he is safely to handle the load of even the weakest link. Far more important, however, is the skill required to keep the peak load of a fall below the lowest of the link values, and as much lower as practicable. Young, Peabody, Underhill, and Brower[33] have each devoted many pages to excellent descriptions of the fundamentals of the body belay so that there is no need of repeating them here. Young's original preference for the hip belay as the best of the body belays has been fully confirmed by later research. The shoulder belay has, however, been recommended so consistently by modern authorities that

[33] Young, *op. cit.*, 1920 ed., pp. 218-227, and p. 258; 1945 ed., p. 168 ff.
Peabody, *op. cit.*, n. 11.
Underhill, *op. cit.*, n. 3.
Brower, David R. (ed.), *Manual of Ski Mountaineering*, Berkeley, 1946, pp. 167 ff. (with drawings).

Young states in his 1945 edition of *Mountain Craft*, "The shoulder belay is now the more generally adopted; but opinions still differ as to which makes the securer stance mechanically: the character of the stance must decide."

Many authorities have recognized the severe strains placed upon the belayer by the fall of a climber, but few, if any, seem to have tested the efficacy of different belaying techniques by repeated practice falls. Only by close comparison of the effects of several falls held consecutively by different techniques can one realize the extreme weakness of the shoulder belay as compared with the hip or piton belays. It is possibly this same lack of a practical and analytical study of the actual effects of falls that has prevented the full realization of the great forces involved. Thus Young still insists, by correspondence in 1946, that the sitting hip belay is unsound. He correctly points out the great value of the resiliency of the spring of the legs in a standing belay, and warns against the dangers involved in a sitting belay that is merely a static lump on a ledge. But Young, and most other authorities, overlook the immense difference in resiliency as between the give of the body and the knees, amounting to a few inches or a foot, and the gradual check provided by an intentional running of the rope for several feet. Young even mentions wrapping the rope around the arm, stating that "this is convenient, but not without risk," and advocates it on certain steep positions.[24] In fairness to him it must be stated that he has more capably and emphatically than any other writer stressed the great danger of the rigid belay and the vital necessity for maximum spring and resilience. He is fully aware of the dynamic belay, referring to it as the "running belay," one of the "expert belays" that "only great skill and strength can hope to regulate,"[25] and has used it himself on several occasions. It does require skill, but that skill can safely and enjoyably be acquired in local practice. No party is justified in using a rope without adequate skill in belaying.

The technique of the modern dynamic belay is fairly simple, consisting primarily in adopting methods that will permit the rope to run a bit. For the body belay choose a position that will permit

[24]Young, *op. cit.*, 1920 ed., p. 225; 1945 ed., pp. 174-175.
Wedderburn, E. A. M., *Alpine Climbing*, London, 1936, p. 38.
[25]Young, *op. cit.*, 1945 ed., p. 178.

tripod security—a sitting position with the buttocks so braced that the mass of the body will not be thrown out of balance by the fall, and with adequate brace for the feet. Careful forethought must be given to the final direction of pull if a fall occurs. This is particularly important in belaying a man who is traversing or climbing above. If possible, the body should be adjusted so that the direction of final maximum force is on a line between the legs, whether the belayer is facing directly outward, or diagonally sideways. Such a line of force will minimize any tendency to be thrown off balance sideways. Outward pull is best resisted by arranging the body position so that the final pull will be directly in line with the rope from the hip, down the extended inner leg (next the inside of the ledge), and inside of the foot. Although Underhill has advocated a bent knee for the outer leg to absorb shock, Young's preference for a rigid leg has been confirmed by the thousands of man-hours of belaying instruction in the U. S. Army. While the bent knee will flex more to absorb shock, too heavy a peak load will result in total collapse. The best position for the hands is with palms up, arms close in front of the body. The "feeling" hand on the rope to the climber controls the amount of slack. In belaying from above it should rhythmically tighten and slacken the rope so as to distinguish at all times between rope friction on the rock and the gentle tautness of the rope against the waist of the climber. If a fall occurs, no effort should be made to hold with that hand; to do so may result in rope burns. The friction of the rope on the clothing around the body will absorb a great deal of force, the rope being held by the further "braking" hand. On short falls the rope will not even need to run; more severe forces can be checked gradually by body friction, permitting the rope to run until the force of the fall is absorbed. A body belay should not be relied on to hold a high, free fall of a leader.

The dynamic belay over carabiner and piton is even easier. This is because the kinetic energy developed in a fall is partly absorbed in friction over the carabiner. If with the body belay a peak force is developed, even for a moment, that is greater than the knees or the balance of the belayer can stand, he will usually lose control. On the other hand, with the piton belay, such a force can readily be dissipated in momentarily lifting the belayer a little into the air. Once the sharp peak of the shock has passed the be-

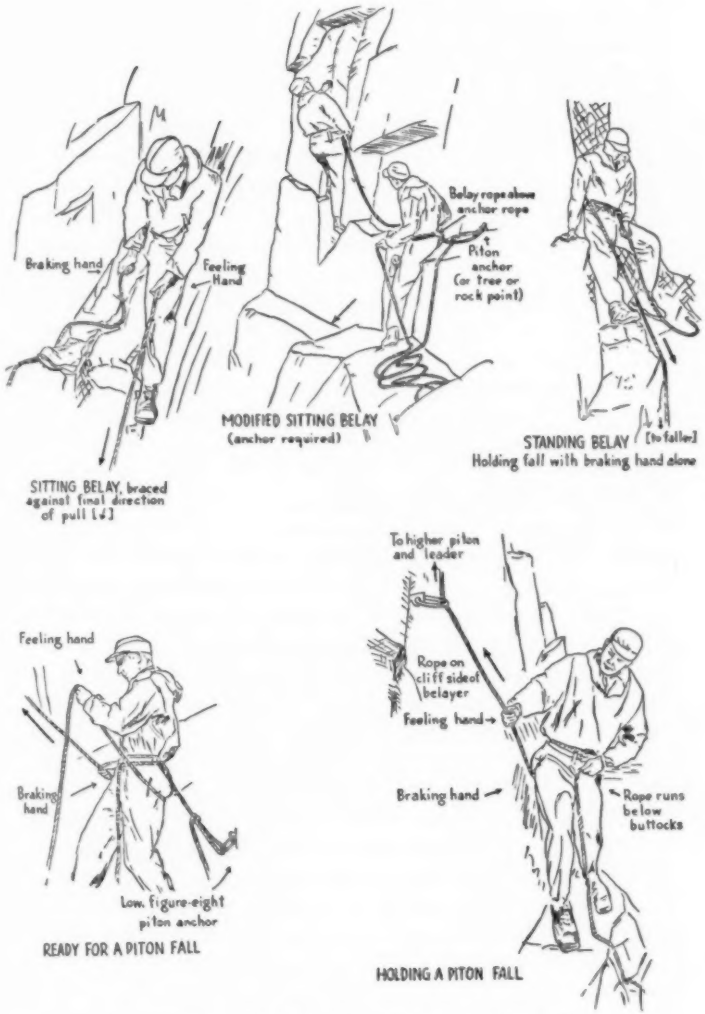

Braking hand
Feeling Hand
SITTING BELAY, braced against final direction of pull [↓]
Belay rope above anchor rope
Piton anchor (or tree or rock point)
MODIFIED SITTING BELAY (anchor required)
STANDING BELAY [to faller]
Holding fall with braking hand alone
Feeling hand
Braking hand
Low figure-eight piton anchor
READY FOR A PITON FALL
To higher piton and leader
Rope on cliff side of belayer
Feeling hand→
Braking hand
Rope runs below buttocks
HOLDING A PITON FALL

Figure 4. THE THREE MOST RELIABLE CLIMBING BELAYS.
(From *Manual of Ski Mountaineering.*)

layer can usually regain control. It is nevertheless important to anchor him in line with the direction of pull wherever possible, for the maximum force of a high fall may be too great to recover from. In piton belaying the most effective place for the rope is under and around the buttocks of the belayer, who belays from a semicrouched position with knees bent. This provides a relatively broad and tough area for the absorption of the bruise and heat caused by a high fall. More important, it permits the mere weight of the belayer to absorb the very high instantaneous peak load of a fall. Under no circumstances should the rope be held above the buttocks as advocated by Maduschka and Henderson.[26] The reasons are several: 1. The force of the fall is transmitted to much weaker and more sensitive portions of the body; 2. the rope tends to jam under the armpits; 3. the force being applied so high on the body may, on a diagonal line of pull, overturn the belayer at the instant of peak load instead of being absorbed briefly in the lifting of his weight.

On high falls the static friction before the rope begins to run is very dangerous. Unless conscious effort is then made to relax, permit the rope to run, and *then* start to check the fall, the static friction alone may develop an instantaneous peak load that is disastrously great. Once the rope is running around the body, the force of the fall can be brought under control as smoothly and effectively as on a swift rappel. On a long lead the leader must therefore carefully note the amount of drag on his rope that is due to friction through carabiners and over rock, and warn the belayer of it. If friction is great, the belayer must see that the rope between him and the first piton is always slack. The leader must also realize that he cannot risk as high a fall when friction is so great. On leads of exceptional length and severity it is wise for the leader to be tied on with two ropes. Only one is snapped through the carabiners on the first half of the lead. Before the friction becomes dangerously great the first rope is tied to the highest convenient piton, and all subsequent belaying is done with the second rope, which then is subject to friction only for the upper half of the lead.

It has already been pointed out that to keep the force of a

[26]Maduschka, *Mtnrng. J.*, May, 1933, 1:3, p. 157.
Henderson, *op. cit.*, p. 16.

high fall within reasonable limits the rope must give or slide. The amount that it can be permitted to slide is a matter of practical compromise. When a high fall occurs some extremely rapid observations and decisions must be made. The amount of belaying rope that is free for use and the distance to the next ledge below must already be known. A belayer is of little value if he absorbs only one-fourth of the kinetic energy of a fall, leaving the balance to be suddenly used up as either the rope or the distance to the ledge gives out. The ideal belay checks the fall uniformly over the entire distance to the next ledge, permitting the climber to land on his feet with residual force equivalent to a jump of two or three feet. Such technique imposes the least possible force on each link of the chain of belaying, particularly on the ribs of the climber, who all too frequently is left hanging in midair for a while after the rib-crushing shock of a sudden check. That ideal, however, must also be subject to compromise between the safety of the ribs of the person falling, and the probability of cuts and abrasions from contact with a cliff less than vertical. In using the dynamic belay one must see to it that enough free rope is ever available, and so laid that the rope can run out rapidly without snarling or jamming.

The most dangerous tendency in all belaying is the instinctive tendency to "freeze" under the psychological shock of a fall. This inevitably results in a rigid static belay with all the severe forces incident to the sudden check. One too frequent effect is that the belayer is jerked into space, and the entire party is lost. He must never check the fall so abruptly as to be pulled off; even if he has to drop the climber at a very rapid rate, little harm may result, as the following experience will illustrate: A beginner had started up a pitch without checking to determine whether the belayer was ready. The shock of the unexpected eight-foot fall caught the belayer by surprise and the static friction overturned him. Having long experience with the dynamic belay, the belayer relaxed his grip on the rope and applied just less than enough braking force to pull him from the ledge. The climber landed unharmed on a ledge fifteen feet below; the rope's running around the prone body of the belayer had checked his fall as effectively as the rope around the faller's own body would have done had he been making a fast rappel. Young, also, gives several excellent examples." Naturally,

the belayer should be anchored wherever practicable. But in the event of a fall which for any reason he cannot check he *must* drop the climber under partial control and avoid at all costs being pulled off himself. This is not the theory of "sacrificing the leader"; on the contrary, it is the best possible means under the circumstances of saving the leader and the party. If any single rule can be given concerning mountaineering falls it is that the *belayer must not fall*

Perhaps a few more actual mountaineering examples will illustrate the difference between the effectiveness of the static belay and that of the dynamic belay.

Alec Dalgleish[28] was stopped by difficulty while on the seventh attempt on Mount Waddington. Possibly because of tradition, or the great height of the final face of the peak, pitons were not being used. The climbing was on a high-angle rock rib above a steep snow couloir. When descending, and about thirty feet above his belayer, he slipped and plunged off into the couloir. The belayer quickly took in slack (repeated tests have since shown this practice to be worse than futile) and then held the rope as firmly as possible over the rigid rock belay. The force developed by the sudden check swung the leader with as sudden an impact into the rock rib, and the rope was severed where it slid across the rib's edge. When the body was recovered at the base of the couloir several hundred feet below it was found that the head had been crushed by the force of the original blow. The account in the *Canadian Alpine Journal* states "the belay thirty feet below held by Brooks and the writer was of little assistance as events transpired . . . One unfortunate aspect of the accident is that it might not have terminated fatally had Dalgleish not been roped." There is no intent in these illustrations to censure, for it is by no means clear that even the most expert with the dynamic belay could have checked an unexpected sixty-foot fall over a sharp edge. But it is clear that the static belay in this case did result directly in the sacrifice and death of the leader. Even with the normal sixty-foot interval of rope between climbers it would have been possible with the dynamic belay to have checked the sixty-foot fall over a distance of thirty feet, resulting in a maximum force of only about four times the weight of the leader, a force so small as to be unlikely to cause injury. The running of the rope

[27] Young, *op. cit.*, 1920 ed., p. 258; 1945 ed. p. 210.

[28] "Fatal accident on Mount Waddington," *Canadian Alpine J.*, 1933, vol. 22, p. 49.

would also have tended to abrade it for several feet, rather than to sever it in one place. Actually, the belayer seems to have had even more than 60 feet of rope available.

R. Todhunter,[28] with traditional contempt for the "treacherous security of mechanized climbing" was leading a high-angle face in the Dolomites without the protection of pitons. As Abraham puts it, "[pitons and carabiners] enable professionals to safeguard their lives and livelihoods; but on Doe Crag this is not necessary, nor justifiable on any British climb." He then cites the Todhunter case to illustrate how the ingenuity of a skillful climber can within limits adapt natural rock belays far more effectively and safely than the despised piton. Recognizing the need for an intermediate belay when far above his belayer, Todhunter untied his waist bowline, threaded the rope behind a chockstone jammed in a crack, and tied in again. Abraham then states that at some distance above this improvised belay point "a slip occurred and he fell backwards through space. The depth of the fall was too much for the strength of the rope; it broke over the chockstone. The second man felt no strain and he was saved . . . Great care is needed in making certain that the rope runs freely . . . this might possibly be the cause of the accident." It is indeed a strange inversion of logic to cite such an accident as an illustration *against* the effectiveness of the dynamic piton belay. The free running of the rope through a smooth carabiner might have prevented the fall, as Abraham inversely recognized. Moreover, once the fall had occurred a free-running dynamic belay would have been possible; there would not have been the sudden, fatal check of the static rock belay.

Young and *George Leigh Mallory*[29] were climbing with a third man well up on the face of the Nesthorn with Mallory in the lead. Young states, "At about my shoulder level . . . there was a nick on the extreme south corner of the slab. Across this I could pass George's rope, and as my footing was good and my two hands could hold and spring the rope conveniently on either side of the nick, I felt certain of keeping the belay sufficiently 'indirect' to be sound . . . I saw the boots flash from the wall without even a scrape; and, equally soundlessly, a grey streak flickered downward, and passed me, and out of sight. So much did the wall, to which he had clung

[28] Abraham, *op. cit.*, p. 152.
[29] Young, Geoffrey Winthrop, *On High Hills*, London, 1927, p. 182.

so long, overhang that from the instant he lost hold he touched nothing until the rope stopped him in midair over the glacier. I had had time to think, as I flung my body forward onto the belayed rope, grinding it and my hands against the slab, that no rope could stand such a jerk. . . . The boots had been standing some fifteen to twenty feet above me, so that the total fall could not have been much less than forty feet. But the rope held, springing like an elastic band, and cracking under my chest and hands on the rock. We were using that year a then rather popular Austrian woven rope, since entirely condemned. Whenever, in later years, I have looked at the tabulated rope tests, which shows that this rope is warranted to snap like straw under the jerk of a man's weight falling from, I think, five feet, I have thought again of the transfigured second in which I realized that the rope had miraculously held. The fact being, I suppose, that two rather abnormally resilient anatomies at either end of a rope may introduce a confusing element into the nicest theories of strains."

Young early recognized the dangers of the rock belay and vigorously condemned its use as a "direct" or static belay. Although he was never able to express clearly in writing the technique of his "indirect" belay it seems clear that in actual experience he certainly had splendidly achieved the fundamentals of the dynamic belay." "I have had on several occasions the man above or below me in a steep snow or ice couloir fall out of a breaking step while we were all descending together. On an occasion when the man below me slipped my first effort to check the rope told me that I was not firm enough. A second or two were needed to allow myself and the man roped to me above to get 'planted.' I partially checked the rope three times, and had to let it go again at cost of hand and glove, before I felt the rope from the man above tighten on my waist, and so knew that we were ready to take the full jerk together, from our combined stances. The intermediate checks had broken the impetus sufficiently to make the final arrest easy. On another occasion in a steep couloir, when I was descending first, the man above me slipped, and the last man on the rope, then in mid-stride, was unable to check the slide at once. He therefore let the rope rush through his hand until the sliding man had spun down past me. Then, of course, my rope to him also came into action, and dividing the shock between us, we easily stopped the fall. On rock, the fall is usually more sheer,

and the gradual check more difficult to apply and more costly in cuticle. But I have twice known great guides, in the case of a man falling while all were moving together, grip the rope, find themselves unstable to hold, let it run, readjust, and finally hold both rope and man with one hand."

Artur Argiewicz, Jr., a brilliant young Sierra Club climber, killed in action with the 10th Mountain Division in Italy, provided, before the war, a splendid example of how effective, skillful dynamic belays can be. On the high-angle cliffs of Hunters Hill, a local rock-climb in California, he was ensconced on an inward-sloping ledge—the floor of a small cave—and was using a sitting hip belay, since there were no suitable piton cracks at that point. His feet were hanging free over the edge. In a report written a few weeks later, he stated, "After asking me if my position was secure, Bob Page climbed quickly upward, and slightly to his right until he was an estimated fifteen feet above, and ten feet to the west of me. . . . I craned my neck upward just in time to hear a loud 'crunch' and see Bob falling down and outward. He was slightly crouched and facing directly inward as he hurtled past me and out of sight clutching, as he fell, a seventy-pound slab. The rope tightened, and then whirred around my hips and finally held—visibly stretching as Bob's 160-odd pounds were brought to a halt. [Argiewicz's weight was approximately 140 pounds.] . . . The rope used in stopping the fall was 7/16-inch Manila yachting cordage. It had been used several times since its purchase five months earlier. It had suffered only superficial fraying prior to the accident. The rope was not visibly altered as the result of the fall. It is believed that the resiliency of the rope was a considerable factor in successful holding of the fall.

"The reactions of the belayer were not conscious, but a result of training and instinctive reaction. Training required that some slack be released; instinct demanded that the fall be arrested as soon as possible. As a result an estimated six feet of slack was released, instead of the expected ten or fifteen feet. The shock of the fall coming on a sitting hip belay was not severe, although some minor rope burns were suffered by the belayer. Fortunately the position chosen allowed a downward, rather than an outward pull of the rope on the belayer, as it is not believed that the fall could have been held had an outward force of equal magnitude been applied."

Other evidence indicates that in addition to the six feet of rope intentionally released, there was sufficient running of the rope, stretch in the rope, and give in the bodies of belayer and climber to permit the 30-foot clear fall to be checked over a distance of nearly fifteen feet. Thus at no time had the force exceeded four or five times the force of gravity. The leader was stopped in midair over ninety feet above the jagged talus, and while injured by strikes against the sharp lava in the swing across the eighty-degree face, he had survived a fall that would certainly have been fatal at least to himself had the classical static rock belay been used, and possibly to both men, had the dynamic belay not been used. Page not only survived the fall, he later joined the Mountain Troops himself!

Argiewicz was able to hold that fall because he had studied belaying just as earnestly as one would seek to learn the technique of landing a plane before attempting to do so. In the fun of Sunday practice at local rocks he had held so many similar falls that his corrective action was largely the result of well-trained reflex. The dynamic belay is no new discovery, but with reasonable practice in using it (and in learning the limitations of other belaying techniques), one need no longer feel that good belaying is for such an exceptional few that most parties must plan on sacrificing the leader if he should fall.

It is still not good for a leader to fall; but if he does, this much is certain: the rope *must* run, and the belayer *must not* be pulled off.

SIERRA CLUB

Founded 1892

MILLS TOWER, SAN FRANCISCO, CALIFORNIA

THE PURPOSES OF THE CLUB ARE: *To explore, enjoy, and render accessible the mountain regions of the Pacific Coast; to publish authentic information concerning them; to enlist the support and coöperation of the people and the Government in preserving the forests and other natural features of the Sierra Nevada*

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Members in the Service, World War II

[The roster of Sierra Club members who were in the armed forces contains more than a thousand names. It is undoubtedly not entirely accurate; time does not stand still long enough. But the following list has been carefully compiled by Harriet T. Parsons and Blanche Stallings from a recent questionnaire sent to members previously listed in wartime bimonthly numbers of the *Sierra Club Bulletin* and from other data in the Secretary's files. Apologies are extended for unavoidable errors and omissions.

It is an impressive fact that a club which entered the war years with approximately four thousand members should find one thousand members in the service. The wartime achievements of those members transcends that impressiveness by far. Most of them have now returned, to enjoy the Sierra once again. Scars of battle will keep many from the haunts they would have chosen. Some will not return. Let those who returned not forget their debt. ED.]

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Backus, Standish, Jr.
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Davis, William H.
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Dawson, Muir, T/5, F.A.
Delucchi, Melvin, J., T/5
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Grubb, Jack E., Cpl., M.P.
Guggolz, Jack, Lt.
Guillou, Rene, Chief Engr., ATS
Haack, Victor, Air
Hadfield, R. F., Air*
Hague, Ralph D.
Hair, John W., Capt., A.G.D.
Hale, Edwin W., Cpl., Air
Hall, Warren, Capt., Med.
Halley, Wilbur G., Lt., Inf.
Hanks, Charles W., Capt., Mtn. Troops
Hansen, Robin, Capt., Air
Harrison, Burton, Sgt., Air
Harrison, Richard Stewart, Major, Med.
Harrover, William, 1st Lt., Mtn. Troops
Hart, George D., Col., Q.M.C.
Hatfield, John G., Lt. Col., Air
Haug, Edward J., Cpl., Air
Haun, Allison, J., Lt. Col., Ordnance
Haupt, Ulrich
Hauser, Frank E., Pvt.
Hayes, Willard J., 1st Lt.
Heald, Weldon F., Major, Q.M.C.
Hedden, Alan M., PFC, Med.
Henderson, Randall T., Capt., Air
Henriques, H. J., S/Sgt., Engrs.
Henry, Alan P., Lt., Inf.
Herrick, John L., S/Sgt.
Heryford, Donald L., Capt., Air
Hewlett, William R., Major, Signal
Heyneman, Donald, 1st Lt.
Hildebrand, Milton, Capt., Mtn. Troops
Hirschkind, Richard W., Capt., Air
Hoag, Carl L., Jr., 1st Lt., Air
Hoard, Lee M., PFC
Hofmann, John Richard, Jr., 1st Lt., AA
Holland, Lawrence, Sgt.
Holliday, Jay N., Capt., Air
Holmes, Frederick B., Capt., C.A.
Holser, H. Donald, T/5
Horgan, Dennis N., Engrs.
Houston, Richard C., 1st Lt., Air
Hudson, Fred W.
Humber, Herbert W., Capt., Air
Hunt, James L., Pvt.
Hyland, William H., PFC
Israel, Julius
Jacobs, Edgar N.
Jacobs, Martin V., 1st Lt., Air
Jacques, Kenneth B., Capt., Med.
Jennings, Thomas M.
Jensen, E. Raymond, Sgt., Signal
Jobson, Cyril B., T/Sgt.
Johnson, Daniel, Air
Johnson, Dorvan R., Capt., Air
Johnson, Lawrence P., Lt., Inf.
Joost, William M., Capt., Inf.
Julien, Gordon H.
Junkert, William E., 1st Lt., M.A.C.
Kain, James A.
Kammer, J. I.
Kauffman, L. Daniel, Capt., Air
Kauffman, Richard N.
Kaufner, Paul W., Pvt.
Kelley, Frederic R., Capt., Air

Kelly, Donald E., T/5, Signal
Kerry, Reuben Ralph
Kimball, H. Stewart, Capt., Med.
Kinnare, Robert, Signal
Kirker, Harold, Sgt., Q.M.C., Mtn. Troops
Kirkwood, Murray D., Major
Klein, Wilhelm, Sgt., Mtn. Troops
Knoll, Henry L., Major, Air
Koch, Howard, 1st Lt., Mtn. Troops
Koch, Robert L., M/Sgt., Signal
Kohn, Henry I.
Kopp, Herbert J., 2nd Lt.
Koskinen, Edward W., S/Sgt.
Koskinen, Edwin R., 1st Lt., Ordnance
Krause, Arthur C., 2nd Lt., Air
Krupp, Oscar, Col., Ordnance
Krupp, William E., Capt., Engrs.
Landauer, Walter
Langsdorf, Gordon C., Lt., Med.
Lansing, Lloyd S., Capt., C.A.
Leonard, James H., Capt., Air
Leonard, Richard M., Major, Q.M.C.
Leovy, William A., Lt., Med.
Lerch, Theodore T., Capt., Med.
Leslie, Roland R., Major, C.W.
L'Esperance, Raymond G., Cpl.
L'Hommedieu, James H., Jr., Air
Lindsey, Solon Russell, Mtn. Troops*
Linford, John, Capt., Air
Lippmann, Fritz, 1st Lt., Air
Lobree, Stanton E., 2nd Lt.
Look, Claude A., 1st Lt., Air
Lund, Jack H., Major
Macaulay, Edward L., Col., C.A.
Major, Jack, Cpl., Mtn. Troops
Manetta, Albert, S/Sgt.
Marshall, Donald A., S/Sgt., Inf.
Mastrangelo, Elio
Matthew, F. H., Lt., Air*
Matthews, Vinton S., Major, C.A.
May, Randolph P., Major, C.A.
McAndrew, William Peter, T/Sgt.
McColm, Ralph W., Cpl., Air
McCurdy, Bertheau, Lt., Air*
McGarr, Arthur F., Lt. Col., Ordnance
McGeein, Donald A., Pvt., C.A.
McGeorge, Sherman B., Sgt.
McIntosh, Donald Keen, 2nd Lt., A.T.C.
McLane, John T., Jr., Engrs.
McMahan, Bernard S., Lt. Col., Med.*
McMillan, G. W. J., Capt., Ordnance
Meckel, Robert B.
Mercer, Arthur
Metcalf, John R., 1st Lt., F.A.
Meyer, Dean, PFC
Meyer, Richard N., Lt.
Meyerhof, Robert, Mtn. Troops
Middlesworth, Glenn S., Jr.
Middleton, Arthur Warner, 1st Lt., Air
Miller, Daniel John, PFC, Mtn. Troops
Miller, Gordon, S/Sgt., Mtn. Troops
Miller, Norman, Air
Millett, Marion
Moblad, Walter G., 2nd Lt., Air
Mohammad, Ali, C.I.C.
Moller, Ralph O., Air
Monges, Richard F., Jr., Pvt.
Moores, William E., 1st Lt., Air
Mowbray, M. V., T/5
Mugele, Raymond A., 1st Lt., Engrs.
Mulay, Ambadas S., 2nd Lt.
Munoz, Robert E., Pvt., Air
Nance, James F., Capt.
Nelson, David A., Cpl., Engrs.
Nelson, Donald M.
Nelson, John F., Major, Air
Newfield, Lou, Jr., 1st Lt., Air
Nicholls, John W., S/Sgt., A.G.D.—G.H.Q.
Offerman, Frederick H., T/Sgt., Mtn. Troops
Ogburn, Raymond Roy, Lt.
Ogilvie, Robert C., Lt. Col.
Olcott, Frank L., Jr., M/Sgt., Engrs.
O'Leary, Lawrence A., Major, C.W.
Olshausen, R. Detlev, Cpl., Air
Olson, Richard D., T/Sgt., Air
O'Malley, Virginia Louise, 1st Lt., Med.
Orcutt, Philip Dana, Major
Owen, F. E., Sgt., Air
Pallas, Albert E., Jr.
Parizek, Rudy W., Cpl., Inf.
Parker, Alan Breck, S/Sgt., Air
Parrish, Jerome H., PFC, Signal, Air
Parsons, Kenneth R.
Parsons, Norman S., Lt., Signal
Pascoe, John R., Col., Ordnance
Pauls, Frank P., Capt., Sanitary Corps

Pease, Edward Allen, Jr., Sgt., Med.
Peterson, Richard H., Cpl., Air
Pettingill, Stuart A., Air
Pierce, Edwin B., Cpl., Med.
Poindexter, John D., Lt.
Poschman, Harry W., Sgt.
Poulter, A. F., Major
Pratt, William Held, T/5, Engrs.
Pundt, Rolf, Sgt., Mtn. Troops
Purchase, Alan, 1st Lt., Air
Rankin, Laurence W., Lt., Air
Rappole, A. W., Capt., Med.
Ratcliff, John Peter, 2nd Lt., Signal
Raymond, William D., Air
Ready, Robert
Reese, John D., Major, Med.
Reno, Louis, Capt., Air*
Riegelhuth, Jack, Sgt., Mtn. Troops
Ringler, William, Major, Air
Roberts, Earl W.
Robertson, Charles B., Major
Robinson, Arnold H., Lt., Air
Robinson, Bestor, Col., Q.M.C.
Robinson, Richard H., 1st Lt.
Rognaas, John T., Cpl., Med.
Roof, James B., PFC, Avn. Engrs.
Rosberg, Carl G., Jr., Lt.
Rose, Robert P.
Ross, Carlton, Cpl.*
Rowser, Robert F., S/Sgt.
Ruge, Neil M., Major
Russell, J. C., Jr., W.O.JG
Sainio, Paul, Capt., C.E.
Saroni, Alfred B., Jr., Air
Sattler, William H., T/Sgt., Signal
Saunders, Thomas W., Air
Sawyer, Frank Elliot, Sgt.
Sawyer, Houghton F., M/Sgt., Signal
Schagen, John P., 1st Lt., Engrs.
Schagen, Paul S., S/Sgt.
Schallenberger, Robert R., T/3, Mtn. Troops
Schelling, Otto
Schmidt, Byron, Pvt.
Schmidt, H. W., Major
Scott, Eugene C., Air
Scott, Peter D., Sgt.
Seach, Robert W., S/Sgt.
Seaman, Malcolm H., PFC, F.A.
Serna, Jon de Dios, Cpl.
Severson, E. Parker, Pvt., Med.
Shade, Enos H.*
Shapiro, Marvin R.
Shay, Carleton, T/5, Mtn. Troops
Sherwin, Elton B., Jr.
Shiverick, Charles II, T/5
Shrader, Clark W., Air
Sias, Thomas C., Inf.
Siegrist, Sanford
Sikora, Paul J., Capt., Dental
Simon, Edwin J., 1st Lt., Air
Slyfield, Richard E., Air
Small, Edward A., Jr., 1st Lt., Ordnance
Smith, Francis Malcolm, Capt.
Smith, Malcolm G., T/Sgt., AA
Smith, Perrin F., T/4, Signal
Smith, R. Wayne, Cpl.
Snyder, Robert R., Lt., Air
Spiegelberg, George
Spring, Paul Melvin, Pvt.
Spring, Roy Anderson, T/5
Sproul, John Allen, 1st Lt., Air
Squier, Leslie H.
Steer, Stanley J., Capt., Air
Steeves, Harold L., Inf.
Steman, Robert L., Sgt.
Steven, Hugh W., Capt., Q.M.C.
Stevens, Albert W., Lt. Col., Air
Stevens, Harley, Lt. Col.
Stevens, William D., Capt., Air
Stimson, Gordon, Major, Mtn. Troops
Stinchfield, Phillip R., Capt., Air
Sullivan, Miles F., 2nd Lt.
Swan, Robert, Capt., Ordnance
Swayne, Richard
Sweetland, Gene
Swing, Warren S., Sgt., Band
Symmes, Laurence M., Jr., Sgt.
Tandy, William J., Major, C.A.
Tatum, Edward H., Jr., S/Sgt.
Taylor, Lawrence D., 1st Lt., Ordnance
Taylor, Richard W., Lt., Air
Thomas, John Wickson, Major
Thompson, Arthur H.
Thompson, Edward G., 1st Lt., C.A.C.
Thorson, George, Lt., C.A.
Timby, Henry E., 1st Lt., F.A.
Toby, Harold Leslie, Cpl., Air
Trubschenck, Lorin N., Capt., Air
Turner, Louis, Lt. Col., M.P.
Tuttich, Charles M., 1/Sgt.
Vandewater, Blake C., Lt., Mtn. Troops
Voss, William B., Capt., Ordnance, Air
Wade, Robert S., Lt. Col., Med.
Wale, Robert Bruce, Air
Walker, James R., Jr., C.A.
Wallace, Earl R., Sgt., Air
Waller, Theodore

Wampler, Joseph Carson, 1st Lt., Signal
Wayburn, Edgar, Major, Med.
Wayburn, Lewis
Weber, Heinz P., Lt., Ordnance
Weber, Richard F., S/Sgt., Mtn. Troops
Weil, Robert, T/5
Weitz, Charles S., Capt., C.A.C., AA
Werler, Otto P., Pvt.
Westerfield, James P., Major
Wickersham, Robert E., Sgt., Signal
Wiegel, John Mason, 2nd Lt.
Wiegel, Robert Louis, 2nd Lt.
Wilkes, Alfred T., 2nd Lt., Air
Willoughby, John E., Pvt., Inf.
Wilson, George O., Jr., Capt.
Wilson, James R., T/4, Engrs.
Wolfsohn, Julian H. L., Lt., Air
Woodruff, William W., T/5, Inf.
Woodward, Frederick W., Lt.
Woolpert, John C., S/Sgt., Air
Wright, William Beatty, Lt. Col., Engrs.
Wurlitzer, Howard Pabst, Cpl., Engrs.
Wyckoff, Theodore, Capt., C.A.
Young, Fletcher, A., Cpl., Air
Young, Frederick L., Capt., Inf.
Zinke, Paul J., T/3
Zipperer, William P., T/5
Zipser, Sidney

U.S. NAVY

Aberley, Robert E., QM 3/c
Abraham, Harry C., Lt. (jg)
Adams, Thomas C., Lt. Comdr.
Ainsworth, John D., Lt. Comdr.
Alexander, William D., C/M
Amstutz, Harry P., Lt. Comdr.
Anderson, Edward H., Ens.
Armstrong, James C., Lt.
Arthur, Keith Johnson
Asson, Arthur, S 1/c
Ayres, William A., Ens.
Bailey, Frank J., MM 3/c
Banks, Louis L., Jr., Ens. (A)
Barber, Harry, Lt. Comdr (A)
Barbour, Allen B., Lt. (MC)
Baron, Paul A., SC 1/c
Beckett, John C., Lt. Comdr.
Bedorf, Walter E., SK 1/c, CB
Bernasconi, Melvin
Best, George Otto, Ens.
Bingham, John J. (A)
Bingham, Woodbridge, Lt. Comdr. Naval Intelligence, & OSS
Blankenship, Cecil B., S 2/c
Blosser, John A., Lt. Comdr. (MC)
Bond, Clifford, PhoM 2/c
Bradley, John P., Lt. (jg) (DC)
Breed, Horace H., Lt. Comdr.
Bruman, Joseph R., Ens.
Butterfield, Robert, Ens. (A)
Cahill, James Peter, Ens. CB
Cahill, John E., Lt. CEC, CB
Cahill, Richard F., Lt.
Cahill, Robert W., Lt.
Caratto, Robert L., S 1/c
Cathcart, Frank D.
Chambers, Robert W., SM 2/c
Chaney, Richard W., Ens.
Charlton, Richard, RDM 3/c
Clark, John N., Lt. (jg)
Clark, Lewis F., Lt. Comdr.
Crowley, Arthur J., CG, Air
Davies, Wilbert L., Lt.
Davis, Bernard, ACMM
Davis, Lloyd S., Lt. (A)
Davis, Sol Robert, Lt (jg)
Deasy, David F.*
Del Valle, Joseph, Jr., Lt.
Ebers, C. H., Lt. Comdr. (A)
D'Nelly, Gregg O'Hara, ETM 2/c
Dole, John E., Lt.
Donald, William G., Jr., Lt. (MC)
Doyle, Doble M., Lt.
Drake, Richard M., PM 2/c
Draper, Jerome Chester, Jr. (A)
Duff, Nicholas E., Lt. (jg)
Evans, Evan C. III, Ens.
Evans, Harold W.
Evans, Minton B., ETM 3/c
Evers, William D., A/S
Felsenthal, Harry, Jr., Ens.
Ferrier, Hugh, Lt., CB
Firey, Joseph, Lt. (jg)
Firth, Walter W., CM 3/c
Fischer, Charles A., Jr., Lt.
Fisher, Albert G., Y
Flint, John H., Jr., Lt. Comdr. (DC)
Fross, Roy, CEM, CB
Fuhring, John, Jr.
Fuller, John M., Lt. (jg)
Gaddis, Gordon G., Lt. Comdr.
Gardner, Donald J., Lt. (jg)
Gilpatric, James F., Ens.
Ginner, Clive E., Lt.
Goggin, Roland, SK 2/c

Grandin, Henry, Jr.
Gray, David S., Lt. Comdr.
Gray, Edward D., Lt.
Gray, Ellsworth R., EM 2/c
Greene, Franklin R.
Greene, James C., Lt. Comdr.
Hacke, Chester H., Lt. (jg)
Hale, George Osborn, Lt.
Hall, Benedict M., Lt. (jg)
Hamblin, W. H., Lt (jg)
Hamilton, Andrew J., Lt.
Harding, William T., Ens.
Hardy, Rex, Jr., Lt. Comdr.
Harris, Gerald L., M 3/c (A)
Hart, John C., RM 1/c
Haughn, William E. (A)
Hayward, Frank, Comdr.
Hayward, Warren B.
Hedblom, Andy O., Lt. Comdr.
Hellingsen, John S., SM 1/c (T)
Helmer, George A., Lt.
Hemphill, O. R.
Henry, Raymond E., PhM 1/c
Herbold, Albert B., Lt. (jg)
Herkenham, Norman B., Lt.
Heron, James
Hinton, Rupard A., Ens.
Hirschkind, Robert R., Ens. (A)*
Hoefler, Otto, Ens., CB
Hollingshead, Richard S.
Hollis, Robert W., Jr., Comdr. (CEC)
Hucklebridge, Ted
Hughes, Roscoe T., Jr., Lt. (jg)
Ingraham, Lloyd L., ETM 2/c
Ingraham, John Lyman, ETM 2/c
Irons, Robert
Jackson, Ben, AMM
Jacobs, Philip S., SK 2/c
Jacobs, Robert B.
Jensen, Carl P., Comdr. (MC)
Jessen, Earl, CMM
Johnson, Arthur B., C.Sp (x) ED.
Kaiser, Boynton, Lt.
Karr, Norman W., A/S
Kerth, William J., Jr.
King, William Gregory III
Koford, Carl B., Comdr.
Kreutzer, Frederick L., Lt. (jg)
Kroeber, Clifton B., Ens.
Lachman, George S., Comdr. (MC)
Lansing, Hubert J., SK 3/c
Lawton, Walter J., Lt. Comdr. (A)
Le Clercq, Emerson, Comdr.
Lembeck, Arthur C., CPh
Lewis, H. Robert, S 1/c
Lind, I. L., Lt. Comdr.
Livermore, Norman B., Jr., Lt.
Ludlam, Kenneth, QM 2/c
Mackinlay, John Bradburne, RT 3/c
Macneil, Hugh L., Lt.
Martin, Oliver H., Lt.
McCarthy, James H.
McCracken, David P., Y 3/c
Mehlin, G. Burch, Comdr. (MC)
Meier, Henry A., Ens., Air
Merriam, Lawrence C., Jr., Lt. (jg)
Meyer, L. Bruce, AS V-12 (MC)
Momyer, Joe R., Lt. (jg)
Mower, Calvin R., Lt.
Nelson, Norman M., Capt.
Neyman, C. A., Lt.
Nickelsburg, Stephen L., Lt. (jg)
Nilssen, Alf A.
Noble, Mark, Jr., ETM 3/c
Ogg, Robert D., Ens.
Ohliger, Thomas W.
Pedersen, Arthur H., Jr., PhM 3/c
Pierson, Edgar R.
Porter, Andrew O., Lt.
Prichard, John S., Comdr. (A)
Quinn, John C., Lt. (jg)
Raab, Robert F., S 1/c
Ramstad, Robert J., Lt. Comdr.
Ray, Richard A., Lt. (jg), (A)
Ready, Ralph
Redemeyer, Hubert L., Comdr.
Rhodes, Kenneth O., Lt. (jg)
Ringbom, C. Martin
Rixford, Emmet L., Lt. Comdr. (MC)
Robinson, Edward B.
Rollefson, Ivan L., Lt. (jg)
Rose, John J., PhM 3/c
Ross, Raymond R.
Salz, Richard H.
Schedler, William H., Ens. (A)
Schneider, Ruben, Lt. (jg)
Schultz, Paul, CPO
Schwarzenbach, Christopher
Scott, Benson Graham
Sensibaugh, Robert
Shaw, Donald H., A/S V-12
Sherrill, Samuel J., ACM
Smith, Robert T., Lt.
Smith, Willard W., Lt.
Snook, Charles Wade, Jr., Ens.
Snyder, Willard M. (A)
Springer, John Y., Lt. Comdr.
Sproul, Robert G., Jr., Lt.
Starbuck, A. Franklin, Lt. Comdr.
Stearns, David B., SK 1/c
Steck, George Powell, Ens.
Stephenson, Frank, Jr., Lt. (jg)

Stephenson, Waite H., Jr., Ens.
Stevenson, Harry M., Lt.
Strauss, Fred Allen, S 1/c
Sumner, William A., Comdr. (MC)
Swenson, H. Robert, Comdr.
Tagliapietra, Amedeo, Mo.M.M. 1/c
Tappaan, Francis D., Comdr.
Taylor, Keith S., Lt. (jg)
Templeton, George S., Jr.
Terry, Henry M.
Thayer, E. M., Lt.
Thibodeaux, Page J. III, GM 3/c
Thune, John G., Lt. (jg)
Turrentine, Daniel
Tuttle, Freeman N.
Ulvin, Dorrance, Jr.
Van Dyke, Donald C., AS 1/c
Vieth, William (A)
Von Briessen, Hans, Capt. (MC)
Wall, Myron S., Jr., Lt (jg)
Wall, Robert J., Ens.
Wallace, William D., Lt. (jg), (A)
Warren, Jonathan R., Midshipman
Waterhouse, John
Watson, Ralph P., CCM
Wehmeier, Harvey
Welisch, David A., Lt. (jg)
Westfall, John F., Lt. (jg)
Wharton, Bruce Alan
Wharton, David P.
Wolff, C. Albert
Wolff, Warren, PhM 3/c
Wortham, James L., Ens.
Wurlitzer, Rymund P., Lt. (jg)
Young, C. Llewellyn, CWO
Young, Ralph M., CM 1/c
Zimmerman, F. W., Jr., Y 1/c
Zink, Robert C., Lt. Comdr.

U.S. Marine Corps

Abernathy, Jack P., Air
Blake, Robert, Brig. Gen.
Clarke, Edmund W., Major
Erickson, M. Richard, Capt.
Frincke, Milton M., 2nd Lt.
Gilbert, Frank W
Hamilton, Clayton E., PFC
Jenkins, Sidney F., Major
Johnson, George R., 1st Lt.
Johnston, Randall B., PFC
L'Hommedieu, John A., Pvt.
Livermore, H. Putnam, 1st Lt.
Locke,Gardner,Capt.
Nelson, Howard S., Major
Peeke, Carroll, Jr., PFC
Powell, William D.
Richmond, William George, Cpl.
Robinson, Marshall, 2nd Lt.
Rothschild, Monroe, Cpl.
Ruch, Roger
Sommer, Harry J.
Taber, Richard, 2nd Lt.
Trinies, Herbert O.
Trowbridge, Henry O., 2nd Lt.
Vieth, William H., 1st Lt.

U.S. Coast Guard

Box, Victor, EM 3/c (T)
Cole, Russell W
Gates, Howard, Lt. (jg)
Johnson, George G.
Koeneke, Robert M.
Macauley, Alan C., Lt.
Riddell, John W.
Watt, Rolla B., Lt.
Whitmore, Howard J., Lt.

Army Nurse Corps

Laurence, Ida, Lt.
Lawrence, Bessie, Capt.
Minnich, Genevieve, 2nd Lt.
Price, Grace *Lyman*, Lt.
Rowell, Elizabeth, Lt.
Schrader, Ruth L., 2nd Lt.
Stearns, Mildred *Robinson*, 1st Lt.
Strammer, Helen, Lt.

Navy Nurse Corps

Dennison, Margaret A., Ens.
Nienstedt, Albertine, Ens.
Steffan, Jean, Lt. (jg)
Walker, Helen L., Lt. (jg)

WAC

Aakre, Hilma
Alford, Jessie
Bancroft, Violet L., PFC, Med.
Bayliss, Julienne G.
Bell, Mary S., Major
Bower, Dorothy, 1st Lt.
Bramman, Minna F.
Bullitt, Florence, Lt.
Butz, Inez L., Sgt.
Ellis, Enid, PFC
Higginson, Augusta
Higginson, Margaret
Hunter, Mary Margaret
Kelly, Irene, Cpl.
Keth, Amelia M.
Levy, Jean, Sgt., Air
Lister, Mary
Meeker, Betty Lou, Cpl.
Norton, Joyce, Cpl.
Palmer, Carolyn S.
Sigrand, Pearl
Smith, Mary Collins, Sgt.
Stewart, Evelyn Sue
Stuck, Elaine, PFC, Air
Visman, Cornelia, Lt.
Whittlesey, Bea

WAVES

Aide, Irene
Aitken, Janet
Asher, Jeanne
Aulie, La Vere *Root*, PhM 2/c
Baker, Jane E., S 2/c
Benson, Josephine *Allen*, PhM 3/c
Bissell, Sarah Secor, Lt. (jg)
Bole, Elizabeth, Lt. (jg)
Brazil, Eleanor, Y 1/c
Burnley, Bernice *Robertson*
Davis, Dorothy R., Lt.
Davis, Hope E., Lt. (jg)
Dwyer, Lois E., Ens.
Elton, Eunice, Ens.
Facca, Mary Louise *Kinney*, SP (p) 3/c
Frank, Elizabeth, Ens.
Gillespie, Jane
Hawthorne, Joan, PhM 2/c
Isham, Mary E., Ens.
Knerr, Elizabeth L., Lt. (jg)
Levy, Taube R., RM 2/c
McGuire, Dorothy *Mortimer*, Y 2/c
Newbrand, Helene, Lt. (jg) Air
Owen, Claudia
Rapley, Alice G., SP Y 3/c
Saunders, Madge, Lt. (jg)
Savage, Marthel *Greves*, Ens.
Scholer, June B., Y 1/c
Shaw, Audrey W., Y 3/c
Shuey, Helen, Lt.
Simpson, Helen B., Lt. (jg)
Smith, Carol E., Lt.
Soulier, Glenda *Greves*, Ens.
Starks, Elizabeth *Moore*, Lt.
Strand, Dorothy, T 2/c
Thompson, Dorothy H., Ens.
Yeager, F. A., Ens.

Marine Corps (Women)

Hill, Laura M. *Tabak*, 1st Lt.
Johnston, Helena *Nelson*, Cpl.
Kendrick, Geraldine, 1st Lt.
Montmorency, Margaret I.
Walsh, Catherine, Sgt.

Spars (USCGWR)

Brumbaugh, Margaret E., Lt. (jg)
Larson, Urda, Lt.
Thorpe, Jan Isabel, Ens.

Merchant Marine

Alexander, William D., Ens.
Anderson, Verne P., 3rd Mate
Bennett, Neil S.
Bishop, Roy F., Lt. (jg)
Deasy, James V., Lt. Comdr.
Glathe, John P., Asst. Purser (Staff Officer)
Gardner, Philip T.
Guntermann, George, 3rd Mate
Hawthorne, Richard
Hudson, Richard A., Cadet
Hunt, Schuyler M., Lt.
Knoll, Theodore
Lundborg, Bradford W., Lt. (jg)
Lyman, Theodore B., 2nd Asst. Engr.
McCubbin, James
McLaughlin, James J.
Moulton, James S., Jr.
Nelson, Leland C., Ens.
Patterson, Edward J., Comdr.
Pointeki, John
Powell, David, Ens.
Rucker, Joseph T., Jr.
Salinger, Herbert E., Midshipman
Tulloch, Blair, Lt.
Wellington, Donald R., 2nd Engr.

American Red Cross

Dunshee, Mildred E.
Graham, Betty M.
Goetz, Delee *Staunton*
Haugland, Winnifred
Holton, Helen R.
Hussey, Frances
Jones, Nancy
Keys, Mildred M.
LaGrange, Emeline
Lawrence, Elizabeth
Louisson, Isabel
Merritt, Earl J.
Morrison, Jack
Sneed, Opal J.
Stevens, Lillian T.
Strand, Elsie A.
Todd, Frances
Watson, Marilyn

Miscellaneous

Arnold, Jack T., Canadian Air Force
Chase, Leland P., civilian interned in Philippines
Haugland, Vern, War Correspondent
Hughes, Carol, Civ. Army Hostess, A. T. S.
Luscombe, Harry, Lt., Royal Canadian Engineers
Robertson, Jeanne B., Women's Flying Detachment
Slaughter, Ruth, WASP
Smith, Mary Collins, War Dept., Alaska
Wiggenhorn, John, civilian captured on Wake Island

Stars indicate those who gave their lives in the service of their country.

Notes and Correspondence

After Thirty-Two Years

No one wanted Francis Farquhar to stop editing the *Sierra Club Bulletin*, but he said that thirty-two years on the Editorial Board, twenty-one of them as Editor, were enough for one man, and thereupon, in May, 1946, passed on his blue pencil.

This mythical blue pencil has passed through many hands: David Starr Jordan held it until 1902, James S. Hutchinson until 1904, Elliott McAllister until 1910, William Frederick Badè until 1922, C. Nelson Hackett for two years, Hutchinson for another year, until finally, in 1925, it was passed to Farquhar.

Francis Farquhar brought to the *Bulletin* his love for fine printing, clear writing, and the aspect of Californiana concerned with the Sierra. Typographically and editorially the annual magazine number has been said to be the finest of its kind. This has been no accident. Part of the excellence has of course been due to the skill of the typographical designers of Taylor & Taylor, who have done the *Bulletin* ever since anyone can remember; part has been due to the high quality of photographic and textual copy that has come to the editor unsolicited—and Farquhar is the first to bestow credit to other sources than himself.

But here I should like to point out the primary reason for the outstanding character of the *Sierra Club Bulletin*. I have watched "F.P.F." work on it, develop it, for twelve years now. I've seen him, with judicious suggestions, steer an author in the right direction, so that his contribution has come out smoother, clearer, and more accurate (and I've seen him incur the wrath of authors who thought every last comma was divinely dictated). I've watched his selection of illustrative material that has brought so much sparkle to the magazine's pages, and have marveled at his ability to "connect" with writers and illustrators of the first water, who have then freely donated to a club journal (that has no item in its budget for talent) material which they could well have displayed elsewhere at a handsome profit. His taste has been constantly active in choice and improvement of design. And I have watched him straight-arm those who would reduce the *Sierra Club Bulletin* to a mere printing job just to save a few dollars

In short, Francis Farquhar took a publication which had already become, under capable hands, an excellent one, and has made it outstanding. He has brought to it and the Sierra Club his own literary skill and historical knowledge, well attested by a long and impressive bibliography, which includes the editing of King's *Mountaineering in the Sierra Nevada*, Brewer's *Up and Down California*, and the writing of his research in *Place Names of the High Sierra* and his contributions on the story of Mount Whitney, Walker's discovery of Yosemite, Smith's crossing of the Sierra, and so on through a long list; collectors of Grabhorniana know full well his contribution to many

unique items. To this can be added Farquhar's articles on Yosemite, Big Trees, and the Sierra Nevada, in the latest edition of the *Encyclopaedia Britannica.*

Francis Farquhar, it is to be hoped, is not through with the *Bulletin.* Even if his counsel were not desired by the present Editorial Board, it would still be needed; and it is most certainly desired. The same holds for several Sierra articles that are right now in suspension in the ink of his pen. What has really happened is this: Francis Farquhar is just trying the shoe on the other foot. For a total of thirty-two years he has been harassing *Bulletin* authors with deadlines. Now he merely wants to know how it feels to be harassed himself.

D.R.B.

* *

The High Sierra: The Journey Ends*

The glass-smooth waters of Rae Lake mirrored beautiful reflections of the bordering mountains. As the sun sank from sight, and golden lines across the surface changed to silver and then to inkiness, to rest in camp was a joy. The sky turned to rose and gold. Cloudlets that have been white and fleecy during the afternoon run the gaunt of warm hues. Their edges become bright as flame. Each moment the floating curtain took on a new shade. The warmth gave way to pearl, lead and somberness against a steel-gray sky. The plop of leaping trout told of the finny inhabitants of the lake gathering their evening meal of low-flying insects. Shadows crept up the eastern granite wall and changed its gray to bluish purple and to blackness. The last gilding was pushed from the topmost pinnacle. Over the mountain a bright planet peeped, for the moment a beacon fire on the rim of the world, the forerunner of myriad twinkling points as "one by one, in the infinite meadows of heaven, blossomed the lovely stars, the forget-me-nots of the angels."

Near by, the aisles of the forest grew dim and became part of a black wall. Only the massive columns of nearer trees were visible, and our replenished campfire but imperfectly recreated paths into the distance. The blaze died down. A final tongue of flame leaped out, and vanished. An ember, longer lived than its fellows, broke with a tinkling sound. Its end glowed with added brightness for a moment, and faded. Only gray ashes remain of the fire in which, as we sat in meditation, other pictures were shown.

A night breeze swayed the tree tops into soothing, peaceful whisperings. On the air current came the droning of a distant cataract—a sound which varies with the seasons, faint when winter has laid its icy fingers on the rushing waters, thunderous as the summer sun strips the slopes of snow, but never stilled.

In the thickets, from which during the day small feathered life has proclaimed the joy of living, silence reigned except for such faint rustlings as tiny creatures of the wild made as they went about their nocturnal business. In the distance, a scream betrayed the passing of a mountain lion. An owl in

*From the *Inyo Register,* Bishop, California. This was the last article written by its editor—a man who knew the land of little rain extremely well.—Ed.

a near-by tree voiced his never answered inquiry. We turned in, regretfully conscious that this was to be our last night in such delightful surroundings.

The time comes to bid farewell to the wonderland in which a month has been spent in a memorable journey. A steep route, then one more level, brings us to Baxter Lake. In another mile of travel we reach the foot of Baxter Pass, leading over into Oak Creek canyon. The mountains show varied colors. In one place a collection of dark red and sulphur-yellow stone gives the impression of a wood yard strewn with bark and sawdust.

Baxter, or Oak Creek, pass has an elevation of about 12,000 feet, and the wind was chilling. The gorge at the head of Oak Creek is as rugged as any to be seen on the eastern slope. A cup in the precipice, hundreds of feet from either top or bottom, is filled with a small lake of bright greenness.

The summit crossing was badly located. Descent from it was a slope of small sharp stones which punished our animals; before its bottom was reached every one of them left blood drops on the trail. We lunched at a little meadow where a litter of refuse had been left by earlier visitors. Ere long we were on a fine trail down the canyon, its excellence contrasting with most other trails we had seen. Junction was made with El Camino Sierra above Camp Independence, and we were once more in the heat of Owens Valley.

The round made, estimated at 200 miles of travel, is but one of many that touches part or parts of mountain-girt scenery. Within horseback or tramping distance of valley homes is grandeur which too few Inyoites have seen, and which from accounts of those who know both is not equalled by anything the Alps have to offer. The forks of the Kings and San Joaquin rivers drain areas richer in scenery than can be found elsewhere. Each summit crossing is a gateway to something new and different. Even the comparatively little that we were privileged to enjoy gave a better understanding of the enthusiasm that possesses Sierra Club outing parties, a better appreciation of the sweetness of mountain waters, the rush and life of beautiful streams, the play of sunshine, moonlight and shadow on limpid lakes, the sublimity of mighty heights and depths, the beauty and fragrance of forests and flower-starred mountain gardens.

—W. A. CHALFANT

Mountaineering Notes

One Hundred Mountain Tops

The Hundred Peaks idea originated among a few of us who decided that climbing one hundred mountain summits over 5000 feet in altitude between Tehachapi Pass and the Mexican border was the best way to gain a greater appreciation of the ranges adjacent to Los Angeles, Santa Barbara, San Diego, and Riverside, as well as an accurate knowledge of the peaks, valleys, canyons, and trails throughout the whole southern section of California. The idea has been taken up by other mountain enthusiasts in the Club, so that many Sierrans are now hunting out five-thousanders to add to their collection, keeping records of climbs, and comparing notes. A guidebook to the mountains in the southern part of the State has reached the talking stage. With chapters on history, geology, climate, animals, trees, and flowers, together with detailed maps of the peaks, trails, and ski slopes, this should make a valuable addition to western mountain literature.

In order to aid aspiring Hundred Peakers we have compiled a list of 188 named summits between the Tehachapi and the Mexican line. The list is not final; additions and corrections are welcome. The list was compiled from U.S.G.S., Forest Service, Army, auto club, and other maps, but some of the names are from local sources, trail signs, registers, and one or two names came simply from recent usage among Club members. The altitudes are from the latest sources available; therefore many of our familiar mountains will be found to have lost or gained in height—San Antonio's famous 10,080 has been reduced to 10,059. Where nomenclature is confusing, as on the San Bernardino ridge, we have tried to be logical, but we may not always be right; our mountains have a flighty habit of changing and exchanging names without notice.

Weldon F. Heald

* * *

Mountains of Southern California

Named summits over 5,000 feet in altitude from Tehachapi Pass to the Mexican border

Santa Barbara Ranges			
Peak Mountain	5,845	Reyes Peak	7,488
McPherson Peak	5,747	Mount Abel (Cerro Noroeste)	8,312
Fox Mountain	5,165	Grouse Mountain	8,600
Cuyama Peak	5,875	Sawmill Mountain (No. 1)[1]	8,800
McKinley Mountain	6,188	Mount Pinos	8,826
Santa Cruz Peak	5,556	Bush Mountain	7,000
San Rafael Mountain	6,596	San Emigdio Mountain	7,415
Big Pine Mountain	6,828	Antimony Peak	6,837
West Big Pine Mountain	6,589	Tecuya Mountain	7,178
Madulce Peak	6,541	Mount San Guillermo	6,600
Samon Peak	6,218	Thorn Point	6,950
Montecito Peak (Monte Arido)	6,025	San Rafael Peak	6,851
Old Man Mountain	5,500	McDonald Peak	6,870
Hildreth Peak	5,023	Seward Mountain	6,825
		Alamo Mountain	7,455

Snowy Peak	6,559
Black Mountain (No. 2)[1]	6,198
White Mountain (No. 2)[1]	6,233
Cobblestone Mountain	6,730
Whiteacre Peak	5,079
Frazier Mountain	8,026
Hines Peak	6,702
Topatopa Peak	6,210
Devils Heart Peak	5,203
TEHACHAPI	
Tehachapi Mountain[2]	6,743
Liebre Twins	6,100
Double Mountain	7,950
Cummings Mountain	7,720
Bear Mountain	6,934
Black Mountain (No. 3)[1]	5,680
LIEBRE	
Burnt Peak	5,792
Sawtooth Mountain	5,169
Mount McDill	5,180
Liebre Mountain	5,785
Sawmill Mountain (No. 2)[1]	5,489
SAN GABRIEL (SIERRA MADRE)	
Old Mount Emma[2]	5,056
Mount Emma	5,270
Mount Gleason	6,532
Iron Mountain (No. 2)[1]	5,652
Condor Peak	5,430
Mount Lukens	5,043
Mount Josephine	5,558
Mount Lawlor	5,944
Strawberry Peak (No. 1)[1]	6,157
Mount Deception	5,970
Mount Disappointment	5,994
Mount Lowe	5,593
San Gabriel Peak	6,156
Mount Markham	5,752
Occidental Peak	5,725
Mount Wilson	5,740
Mount Harvard	5,440
Barley Flats[2]	5,630
Mount Vetter	5,906
Mount Mooney	5,837
Monrovia Peak	5,412
Mount Hillyer	6,201
Rabbit Peak (No. 1)[1]	5,303
Iron Mountain (No. 3)[1]	5,047
Granite Mountain (No. 1)[1]	6,597
Round Top Mountain	6,319
Mount Pacifico	7,124
Twin Peaks	7,760
Mount Waterman	8,038
Mount Winston	7,494
Buckhorn Mountain[2]	7,289
Pleasant View Ridge[2]	7,978
Mount Williamson	8,214
Mount Islip	8,250
Mount Hawkins	8,851
Middle Hawkins[2]	8,505
South Hawkins Point	7,780
Mount Lewis	8,395
Smith Mountain	5,103
Rattlesnake Peak	5,819
Iron Mountain (No. 1)[1]	7,995
Throop Peak	9,134
Mount Baden Powell	9,399
Pinyon Ridge[2]	6,530
Table Mountain	7,512
Wright Mountain	8,500
Pine Mountain	9,642
Mount Dawson	9,551
Mount San Antonio	10,059
Sunset Peak	5,794
Sugarloaf Peak	7,006
Ontario Peak	8,752
Bighorn Mountain[2]	8,500
Cucamonga Peak	8,911
Etiwanda Peak	8,701
Timber Mountain	8,358
Telegraph Peak	9,008
Mount Harwood[2]	8,550
Circle Mountain	6,917
SAN BERNARDINO	
Cleghorn Mountain	5,319
Cajon Mountain	5,343
Jobs Peak	5,700
Strawberry Peak (No. 2)[1]	6,150
Heaps Peak	6,400
Mill Peak	6,775
Keller Peak	7,863
Slide Peak	7,807
Crafts Peak	8,344
Butler Peak	8,502
Round Mountain	5,260
Rattlesnake Mountain	5,850
Luna Mountain	5,984
Shay Mountain	6,700
Deer Mountain	5,810
White Mountain (No. 1)[1]	7,710
Lookout Point (No. 1)[1]	7,929
Little Bear Peak	7,600
Delamar Mountain	8,400
Bertha Peak	8,195
Gold Mountain	8,220
Sugarloaf Mountain	9,842
Granite Peak	7,520
Tiptop Mountain	7,607
Mount San Bernardino	10,630
San Bernardino East Peak	10,650
Mount Anderson	10,850
Shields Peak	10,660
Mount Charlton	10,750

Mount Jepson	11,168
Mount San Gorgonio	11,485
Lake Peak[2]	10,126
Mount Grinnell	10,225
Galena Peak	9,100
Kitching Peak	6,607
San Jacinto	
Ranger Peak	5,082
Baldy Mountain	5,500
Black Mountain (No. 1)[1]	7,800
Mount San Jacinto	10,831
Marion Peak	10,315
Jean Peak	10,621
Cornell Peak	9,511
Tahquitz Peak	8,823
Lily Rock[4]	7,973
Antsell Rock	7,600
Palm View Peak	7,140
Lookout Point (No. 2)[1]	5,590
Rock Point	5,302
Thomas Mountain	6,812
Coahuila Mountain	5,624
Little Coahuila Mountain	5,046
Rouse Hill	5,158
Santa Rosa	
Santa Rosa Mountain	8,046
Toro Peak	8,716
Martinez Mountain	6,539
Rabbit Peak (No. 2)[1]	6,650
Sheep Mountain	5,124
Asbestos Mountain	5,262
Santa Ana	
Santiago Peak	5,569
Modjeska Peak	5,470
San Diego	
Beauty Mountain	5,547
Morgan Hill	5,640
Boucher Hill	5,446
Palomar Mountain	6,138
San Ysidro Mountain	6,177
Hot Springs Mountain	6,533
Volcan Mountain	5,700
North Peak	6,028
Middle Peak	5,906
Cuyamaca Peak	6,515
Stonewall Mountain	5,739
Granite Mountain (No. 2)[1]	5,633
Garnet Mountain	5,665
Garnet Peak	5,900
Monument Peak	6,200
Laguna Peak	6,100
Sheepshead Mountain	5,800
Whale Mountain	5,340
Little San Bernardino	
Mount Inspiration[5]	5,575
Lost Horse Mountain	5,461

[1]Duplicate names are numbered for convenience.
[2]Name not well authenticated.
[3]Highest point of ridge.
[4]Called Tahquitz Rock by Sierra Club rock-climbers.
[5]Suggested name for highest point in range three quarters of a mile northwest of Keys View.

* * *

Some Ascents in the Sierra During the War Years

During the summers from 1943 to 1945, four Southern Chapter members spent two-week periods climbing in the Sierra. Several standard ascents and a few new climbs were made.

Minarets.—During one week in July, 1943, Spencer Austin, Dan Bannerman and Chuck Wilts made four climbs in the Minarets. These included the third ascent of Dawson Minaret and the third ascent of Point E (Jensen Minaret). A new route was used on the ascent of Point E. This route, up a chimney on the side facing the Shadow Creek Basin, was considered low class 5 (1 or 2 pitons), and passed over the cleanest, soundest rock found in the Minarets

Yosemite.—Austin, William Pabst, and Wilts spent two weeks in Yosemite National Park in July and August, 1944. Among climbs made were two in the Sawtooth country including the East Tooth (seventh ascent), and three

in Yosemite Valley, Split Pinnacle (sixth ascent), Lower Cathedral Spire (twentieth ascent) and Upper Cathedral Spire (seventeenth ascent).

The route on the East Tooth was the first route in the "Guide," the most interesting part being the remarkable tunnel at the pinnacle. Descent was made by rappelling down the south face. The ascent of the Lower Spire was made by Wilts and Austin without recourse to the conventional lasso of the horn. Their ascent of the Upper Spire was made without the use of direct aid by either of the climbers (possibly for the first time).

Evolution region.—The 1945 trip took Austin, Pabst, and Wilts into the Humphreys, Evolution and Palisades groups. Ascents were made of Mounts Humphreys and Darwin, North Palisade and Middle Palisade. Standard routes were used on all except Mount Darwin, which was climbed probably for the first time via the NE arête (¼ miles E. of route 3). This route involved about 800 feet of class 4 climbing and is thought the most interesting one which has been used on that mountain. —CHARLES WILTS

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SOME YOSEMITE PROBLEMS

BY ROBIN A. HANSEN AND FRITZ LIPPMANN

Climbing in Yosemite Valley came to a virtual standstill during the four years of war, but has since then shown a most remarkable recovery. More difficult climbs have been accomplished since the war than in 1940, previous high year. Winter climbing, begun in 1940, increased considerably, some seven ascents or attempts being made this past year. Serious attempts were made on the principal problems of the Valley

Lost Arrow.—Two attempts were made, with the second gaining a ledge some 120 feet above the First Error and requiring seven hours and forty pitons. At the First Error Jack Arnold tied in and attempted to climb a 70° wet slab using friction, tension, and two-man stand. After gaining some ten feet and placing four pitons (three in one spot) he came down to rest. Fritz Lippmann took over and, after placing one more piton, climbed on to a three-inch sloping mantel covered with running water. This proved to be the crux of the pitch, for in another forty-five minutes he was sixty feet higher, struggling with what we like to call a vertical bushwack through twenty feet of matted bay bush. Close to exhaustion, Lippmann anchored to the tree, and even with the tension from above, Bob Hansen arrived at the belay position with realization that this was one of the more difficult pitches in Yosemite. Jack Arnold then came up on a fixed rope and Hansen led up the last pitch, a class-4 chimney some forty feet high, and stepped out onto a remarkably airy ledge, complete with a bench. This ledge is at the base of the 800-foot chimney which leads to the notch between Lost Arrow and Yosemite Point. It is definitely climbable, at least for a hundred feet and at this point opens up into what appears to be a large bowl. How large it is and whether it actually is a bowl is a matter of conjecture. If, as Dick Leonard writes, "After reaching the base [of the Lost Arrow, one finds that] the route is terrifyingly clear," what can be said of the route from this point?

Half Dome, Southwest Face.—An attempt in June, 1946, by Oscar Cook,

Dick Houston, Lippmann, and Hansen was stopped by smooth rock, high angle, and lack of piton cracks; although opinion was evenly split whether a route up the face is possible, it does seem within the limit of possibility. [This party apparently failed to ascend as far as the party making the first recorded attempt on this route, in 1935.—Ed.]

Pulpit Rock, from the notch.—Three hours, 16 pitons, Class six. From the notch proceed directly upward to a sloping curved shelf; traverse up and to the left (west) to a narrow ledge, continue further left some fifteen feet, and ascend diagonally up and to the right via a piton ladder. At the top of this pitch it is easy scrambling to the summit block via the original route.

Sentinel Rock, North Face.—To a rock-climber one of the most impressive of Yosemite walls is Sentinel Rock, standing as it does some 3,200 feet above the valley floor, with its upper half rearing upward at an angle of 85°. The wall is divided into three sections: "tree ledge," flying buttress, the summit—each approximately a third of the footage apart. The lower third to the "tree ledge" is passed over a scree-covered class 4 ledge traversing upward diagonally to the right at a gentle angle. The route then follows a connected series of chimneys lying just west of the arêtes of the edge of the pinnacle. Thirty-three pitons were employed for the ensuing 200 feet of climbing; there were six pitches, four of which required direct aid. Pitons were placed over a section which looked unsuitable for the placing of same. That the pitons can be placed higher up is within the realm of possibility. The route is there.

[The authors of this contribution have made a brave start toward listing the major Yosemite climbs that have been accomplished since the previous complete accounting in Mountaineering Notes. They lack details, however, and participants are urged to submit them for the next magazine number, planned for April.—Ed.]

* * *

New Yosemite Climbs

Lower Yosemite Fall, West Side (4420).—First ascent, September 13, 1942, by L. Bruce Meyer and Alan M. Hedden. At the horse trail bridge, follow the creek and talus up the left of the fall as far as possible. At the head of the talus and behind brush a crack leads from the left over flakelike rocks and up to a ledge about 40 feet above the talus. From here, the route leads diagonally across to a clump of bay trees. At this point cross pressure is required in ascending a small crack leading to the right and into a clump of bushes. From here climb to the left and then diagonally to the right until a good belay point is obtained at the base of a large fir tree. From this position proceed again to the left around an overhanging triangular rock and then vertically to a ledge a little lower than the top of this fir tree. Climb to the right, horizontally around the face, and over a flake or small ledge; drop a few feet until another ledge is reached which leads diagonally farther to the right. From the top of this ledge, or directly up the face from its beginning, climb to another clump of trees from which the route leads to the right around a nose and up to a grass-covered ledge, which is followed until a slight descent brings one to the top of

the fall. On this climb the leads are quite long, and the rock is none too secure. Care should be taken not to kick rocks on tourists who might climb to the talus below the route. —L. BRUCE MEYER

* * *

Stanford Point. First ascent September 5, 1942 (?) by David R. Brower, Morgan Harris, Alan Hedden, and L. Bruce Meyer. No other ascents. Eight hours, seven pitons (class 5). Climb to top of talus immediately beneath Stanford Point. Proceed unroped for 200 feet higher on a series of easy ledges sloping upward toward the left (E). At E. end of top ledge climb directly up a steep overhanging crack (Class 5) using a partly detached flake on the wall to surmount the overhang. Continue 20 feet up a steep friction crack. Unroped scrambling then leads through brush (exposed in places) for 200 feet more to a broad ledge which is a conspicuous feature of the cliff from below. This ledge leads upward diagonally to the left (E) and in general indicates the route for a large part of the climb. The ledge rises first in an abrupt step which may be surmounted by a slight traverse to the right, by cutting back then to the left to reach the step at its midpoint and continuing directly upward (class 4 pitches, exposed, but holds good). Continue ascending the main ledge, traversing and climbing short chimneys as necessary to surmount breaks in its course. At its upper (E) end this ledge breaks off into the main gully E. of Stanford Point. Since the gully at this level drops off sharply from above, it is best to leave the ledge and continue directly up the face. Several class 4 chimneys bring the route to the edge of a steep, smooth V-type chimney on the face (previously crossed at its base in the traverse along the main ledge). Continue horizontally to the apex of this large chimney on very exposed, tiny ledges (class 5) and up 15 feet on the other side to a tree. Two fourth class pitches lead to the top of a minor buttress where a route into the main gully is visible. This involves descending slightly from the buttress belay point and traversing 15 feet horizontally (E.) to a smooth nose of rock which overhangs at its base. The last movements to gain this nose are very delicate and exposed. Climb 20 feet up nose, placing pitons for safety in a vertical crack. At the top of this crack is an awkward corner which must be turned in very delicate balance by lieback technique. The rope may be removed after this pitch. Continue up brush-covered gully to the valley rim and Pohono trail. —MORGAN HARRIS

* * *

Half Dome, Southwest Face.—(Class 6—800 feet of roped climbing.) First ascent October 13 and 14, 1946, by John Salathé and Anton Nelson.

Six of us, including DeWitt Allen, Oscar Cook, Dick Houston and Fritz Lippmann spent the first of three days packing equipment to the foot of the climb, discovering a spring some 300 yards below, and in making an afternoon reconnaissance for the best-looking route.

Nelson and Salathé got into the lead on an early start and kept at it, with moral support from the other fellows, for 20 somewhat grueling climbing hours. About 150 pitons of all types to fit all varieties of cracks were placed,

half of them for direct aid on the massive smooth granite—which inclines at 60 degrees and more the greater part of the way. No expansion bolts were employed but should be on hand.

The only usable route starts at the base of the converging vertical breaks in the west face just to the right of the two conspicuous pine trees about 100 feet up. About 300 feet up one encounters "The" crack which runs straight up 300 more feet, without feasible alternatives, almost to the great overhang which circumscribes the climb on the left, or north. The crack demands: (1) technical skill to place even a Yosemite assortment of pitons in a very poor crack with adequate assurance, (2) the surmounting of a 6-foot overhang in the crack, and (3) a 200-foot lead from a small, exposed belay ledge just large enough to give the second man support and rest.

From the top of this crack rope traverse 25 feet to the right and up another crack, 150 feet of which ends the piton climbing. This second crack contains a difficult, deep diagonal overhang which is passed to the right, an angle piton having been left about 6 feet up inside it for future use. The only good belay position requires a two-rope lead. A one-rope lead is possible if the second man is brought up and anchored with pitons on a slight 2-inch friction ledge 40 feet below the overhang.

Above, friction work on easier slabs brings one to a lone pine tree which may be considered the end of the climbing, there being but an uphill walk to the summit of the dome. The descent by the cable and long bushwhack back to camp may be avoided by an enjoyable 800-foot rappel starting somewhat to the north of the climbing route. About half-way down, where one breaks away from the big overhang, rope for a 160-foot pitch is needed.

The west wall of Half Dome offers a route more enjoyable to rock-climbers than the cable route pioneering in 1871 by George Anderson, but only to parties limited to two or three (because of time) who are excellently equipped and experienced in using piton equipment. The considerable exposure, the inspiring views and the unsurpassed goal, while demanding favorable weather, water in canteens, and endurance, make the climb a treat of the first magnitude.

—Anton Nelson

* * *

Lost Arrow.—First ascent September 2, 1946, by the party of Jack Arnold, Robin Hansen, Fritz Lippmann, and Anton Nelson, who spent three days in the effort. On the first day a weighted line was finally thrown over the summit of the Arrow from the valley rim. On the second, two of the men rappelled to the notch; following the approximate route established earlier by John Salathé and John Thune, they moved out onto the most exposed face and several feet up toward the outside end of the weighted line. Using many pitons and two expansion bolts for direct aid, they reached the line the third day, pulled over and rigged five nylon climbing ropes. Belayed with one rope over the top of the spire by Hansen, who was sitting on the rim, Arnold climbed a second rope over the top by using Prusik slings. While Arnold established an anchor on the tiny rounded summit, Nelson climbed the rope as Arnold

had done. Lippmann, after dark, crossed to the summit on a Tyrolean traverse that had by then been set up.

Details of the climb are promised for the 1947 annual magazine number of the *Sierra Club Bulletin*. Meanwhile, those of us who used to use an occasional piton or two for direct aid are already speaking of the Golden Age of Mechanized Climbing. We speak, however, with humor, and with no criticism whatever. The summit could not be reached without artificial aids; this party skillfully used such aids as should be included in the equipment of expert rock-climbers on extremely difficult work—and they used no more. The first ascent of the Lost Arrow must go down as an outstanding achievement in any mountaineer's book.

—D.R.B.

Book Reviews

MOUNTAINEER'S BIBLE. *Mountain Craft. Geoffrey Winthrop Young, London. 1945. 4th Edition—314 pages, with 8 photographs. 25 Shillings.*

In 1914 Geoffrey Winthrop Young prepared a manuscript about his experiences and conclusions concerning the equipment, technique, and philosophy of the sport of mountaineering. World War I delayed its publication until 1920, when, adding his own work to that of several others, he edited a comprehensive treatise on most phases of what he inclusively called *Mountain Craft*. The work was so thorough and so accurate in all its fundamentals that it has served for twenty-five years as the finest and most authoritative work ever published on the technique of mountaineering.

Unfortunately, the very thoroughness of the treatment of the subject served somewhat as a drawback. When, in answer to demand, republication was undertaken at the close of World War II, it was wisely decided to reduce the size of the volume from 604 to 314 pages by eliminating chapters covering mountaineering in the major mountain ranges as well as the chapters on mountain photography and ski mountaineering—each a subject large enough for a separate book.

In the latest edition Young has completely revised all his chapters in the previous publication so that much unnecessary or obsolete material has been eliminated and the new publication brought into line with modern thought and experience. The new chapter on equipment prepared by J. P. Farrar is an example. It is now acknowledged that rubber shoes are indispensable for difficult climbing, that a headlight is to be preferred to the candle lantern, and that down bags covering the head give maximum warmth for the weight and bulk involved. The development of the new nylon rope as a result of war experience is reported and it is finally acknowledged that the old overhand knot and middleman's noose are bad and should be superseded by the butterfly knot which Robert Underhill had recommended as early as 1931. In discussing knots Young furnishes excellent advice, stating, "The young climber owes it to himself not to accept tradition, but to make his own choices." This breadth of view pervades his entire work. He does not attempt to set up his recommendations as being above criticism or improvement.

His chapter on rock-climbing has for twenty-five years been the finest treatise ever prepared on the subject of the fundamentals of the sport. His 1945 edition modernizes it in many respects and still offers the beginner or the experienced "mechanized climber" the best source of basic information on the subject. Young explains his love for rock-climbing as contrasted with the older sport of snow- and ice-climbing by pointing out "Rock surface, unlike snow, proved to be almost infinite in its variety and inexhaustible in its offer of novel routes." He observes that "climbers are gregarious, if exclusive. They tend to form eclectic associations."

The only criticism of Young's treatment of the technique of rock-climbing

is a minor one based primarily upon his approach to the use of pitons and related hardware. He admits his lack of experience with them when he says, "In all my alpine life my party only took pegs three times, as a precaution, and only used one once." But his characteristic appreciation of the views of others brings him to urge, as did Willi Rickmer-Rickmers, that "a practice which is sanctioned by many fine cragsmen, who have evolved it to suit their own type of rock and climbing standards, and not ours, must be respected, and especially so on its own territory. There is indeed no abstract principle involved. Principle in climbing can never be more than the formulation of the best contemporary tradition of mountain practice." He next points out evil effects which even the most hardened of mechanized climbers must acknowledge, and must guard against: the ease of "nailing up" almost impossible routes and of rappelling from them tend to inhibit the development of skill in reconnaissance and in climbing down. Young's lack of experience with piton climbing, however, then leads him to suggest, as a substitute for a piton, that either an ice-ax point or a small rock be jammed in a crack. The insecurity of such measures is enough to make an experienced piton man shudder at the thought of it.

"Climbing in Combination," and "Corrective Method" are two excellent chapters in which Young devotes sixty-five pages to the discussion of handling the rope in continuous climbing and belaying technique in case of a fall. His exposition of the fundamentals of belaying is excellent and is the finest that has been published. Although the lengthy article on belaying technique which appears elsewhere in these pages points out certain respects in which recent research has considerably improved the methods suggested by Young, it must be acknowledged that Young may well be right in considering that the dynamic belay is good in theory but requires such "great skill and strength" that it cannot be relied upon except by the most expert. Nevertheless, it is reasonable that mountaineers study belaying with the thoroughness that the risk involved justifies, in order that they can become experts in handling the "running belay."

In his final chapters on Ice and Snow Craft and Reconnoitering, Young's constant reference to climbing unroped on steep snow and ice shows a realization of the basic weakness of belays on snow and ice. This has previously been acknowledged by many other writers who, however, have not had the courage to assert the conclusion that if a belay cannot be relied upon to hold a fall it is often better to climb without the rope at all. The reliance of some European climbers upon sound ice pitons under such conditions seems to be a great improvement in the factor of safety which cannot justifiably be objected to. Young's humor throughout the book shows up pleasingly in his suggestion that gas balloons be towed behind the climber to support the colored "avalanche cord" that has been recommended by many modern writers. He gently ridicules the suggestion that a thousand-ton serac will tremble upon a man's "shouting into its ear." It is, however, unfortunate to find the latest edition repeating the error of the first, in claiming that "cornices form against the wind, not with it, [although] the contrary is sometimes stated." Gerald Seligman, possibly the greatest authority on this subject, agrees, in *Snow Structure and Ski Fields*, with Welzenbach and Paulcke, the Continental authorities,

that "cornices grow to leeward." The point is important in the chapter on "Reconnoitering" but does not in any way substantially lessen the great value of the book.

In fulfilling its purpose—the exposition of the technique of all phases of mountaineering—the latest edition of *Mountain Craft* is without peer.

RICHARD M. LEONARD

* * *

THE PURCELL RANGE. *The Purcell Range of British Columbia. By J. Monroe Thorington. The American Alpine Club, New York.* 1946. *152 pages, illustrated, maps. Price,* $2.00.

If you know where Lake Windermere and Columbia Lake are, you will have a starting point for locating the Purcell Range. It is here that the Columbia River begins, and, as you probably know, it flows north. It continues in that direction for quite a way, then turns abruptly about and heads for the United States. Within the angle thus formed are two mountain ranges—to the west, the Selkirks, straddling the Canadian Pacific Railroad; to the east, the Purcells, entirely south of it. Between them lies the Purcell Trench which is occupied in part by Kootenay Lake. On the Lake Windermere side, the Purcells are separated from the Canadian Rockies by the Rocky Mountain trench. At the south the Purcell Range terminates about opposite the middle portion of Kootenay Lake. Within this comparatively small area are enough big and difficult peaks to occupy a climber for many seasons. At the northern end are the famous Bugaboos, with such highly rated peaks as Howser Spire and Snowpatch. In the middle portion, between Horsethief Creek and Toby Creek, are the highest peaks, Farnham (11,342 ft.) and Jumbo (11,217 ft.); and there is much wild and beautiful country at the head of Findlay Creek and St. Mary River farther south.

All this complicated and utterly wild country has been made comprehensible through Dr. Thorington's well-organized book. Dr. Thorington has done something here that other writers of guide-books might well emulate: he has combined good topographical descriptions with lucid and interesting accounts of his own excursions in the territory; he has given adequate factual information, he has furnished historical and bibliographical data, and, on top of all this, he has provided maps and photographic illustrations of unusual excellence. He has, indeed, "succeeded in presenting something of the thrill of new country, and of the attraction of a mountain land in which the Purcell Range raises its glacier-hung peaks."

FRANCIS P. FARQUHAR

* * *

SKI MOUNTAINEERING. *Manual of Ski Mountaineering. Edited by David R. Brower. University of California Press, Berkeley. Revised ed.,* 1946. xxiv + *202 pages, frontis., 26 text figs. Price,* $2.50.

The original edition of the *Manual of Ski Mountaineering* was written by a group of skiers and mountaineers who had learned from firsthand experience of the requirements and rewards of traveling over mountainous country in the

winter on skis. Soon after the entry of the United States into World War II, the *Manual* was presented as a compact review, for the benefit of civilian skiers and particularly for the training of mountain troops. Since the appearance of the first edition, the theories and equipment discussed have been thoroughly field tested, both in training camps in the United States and by many thousands of man-days of varied activity by the mountain troops in numerous places overseas. The experience which could be gained only by the research endeavors and ample funds of the War Department has verified the original work and added new ideas. The new expanded edition of the *Manual of Ski Mountaineering* is, therefore, a reliable source of information for every mountaineer, be his interests those of summer or winter. The authors of both editions are the same. Most of them served in the armed forces of the United States during World War II, several in the mountain troops; and several of them are directors of the Sierra Club.

The new manual is like an engineering handbook in that it concisely states many facts and innumerable recommendations without burdening the reader with long discussions or explanations. Methods of insulating and producing body heat are given first place. These may seem obvious upon reading; but were they followed universally, much discomfort in the mountains would be avoided. No two individuals could be expected to agree completely on the details of essential vs. desirable equipment. The manual divides equipment into that which is (1) worn, (2) carried in the pack, (3) included for community use, and (4) necessary for difficult climbing on rock and ice. Each of these categories is subdivided into advisable and optional groups. The chapter on equipment includes not only the lists but also a classified discussion, which may be of value to either the novice or expert in improving his apparatus and in checking over his outfit just before leaving on a trip. The recommendation to have only one camera for the party may seem restrictive, but it is consistent with the sane standard which has as its criterion, "What can I get along without?" There is a great difference between the problems of downhill skiing near resorts and those of maintaining balance when carrying a pack and in climbing. Therefore, the manual's advice about ski boots is quite different from that which one usually receives in sporting goods stores or from common literature on skiing

The expanded edition has a new section on equipment for rock and ice. This describes the items and offers numerous practical pointers to preclude loss of equipment or injury from its misuse. There is information on the new nylon climbing ropes which were developed and tested during the war, and which have proved both lightweight and functionally superior to the prewar product

The chapter "Wax and Skins" is short and to the point. Although mountain skiers may differ in their views on the subject, this chapter might well be re-read at the beginning of each ski season.

Several factors affect the selection of food for a ski mountaineering expedition. Obvious considerations such as calorie, mineral, and vitamin content must be worked in with the necessity of short cooking time to save fuel, the dependence of cooking time on altitude, and the importance of different kinds

of food under various conditions of fatigue and weather. The chapter on this subject contains a food list which may be equally valuable for summer or winter use, and will keep down the pack weight to a reasonable figure. During these days of sugar rationing it might be wise to include an ample supply of candy. The manual is not a cookbook, and therefore it is up to the skier to learn elsewhere how to prepare the foods listed.

The chapter, "Technique of Travel" has been modified to include a discussion on the use of skis and poles and on high-angle climbing. Tents, brush shelters, snow caves, and igloos are described in the chapter on shelter.

A beginner could be frightened by the ominous forebodings of disaster which might be suggested by the material on visibility, variable snow, storm, night and fire, distress signals, steep terrain, snow formations, avalanches, and rescue. These are serious aspects of ski mountaineering, ignorance of which might result in anything from discomfort to genuine distress. However, the novice should no more be deterred from his ski-mountaineering future by reading about these subjects, than a beginner from learning to drive a car upon reading of the difficulties and dangers on the public highway—in fact much less so, for the variations in nature, though sometimes sudden and severe, are not subject to the unpredictable vagaries of man. First aid as applied to ski mountaineering differs from that of industry, war, and the highway. Injuries are simpler, but their treatment may be more difficult because of low temperature, limited supplies, and remoteness from professional medical attention.

The three new chapters, "Mountaineering Routes," "Rock-Climbing," and "Ice-Climbing," added at the end of the book, are primarily for the benefit of those few ski mountaineers who are about to start, or are reviewing, their experiences in severe climbing. In "Mountaineering Routes," there appears a most concise and dramatic explanation of the features of a mountain. The rock-climbing and ice-climbing chapters contain considerable technical information as well as diagrams showing the use of rock- and ice-climbing equipment. The book closes with a bibliography of skiing, which includes only those publications to which the reader is referred in the text, or which were drawn upon in the writing of the manual.

The expanded edition of the *Manual of Ski Mountaineering* should be read through by every skier who is adventuresome enough to wander away from the practice slopes, and also by summer mountaineers, whose interests, in the final analysis, are very similar and whose problems are only slightly less challenging.

NATHAN C. CLARK

* * *

COAST RANGES. *The Pacific Coast Ranges. Edited by Roderick Peattie. The Vanguard Press, New York, 1946. 402 pages. Price, $3.75.*

The Pacific Coast Ranges cover such extended and varied regions that to give them adequate treatment would take more than a book the size of this one. The editor has tried however, to give us the high spots of this lengthy stretch of ranges, from the southern California coastal hills to the Olympic Mountains of Washington. Many writers have contributed, some well known, and

others not so well known, but each one has written on a subject on which he or she is an authority. The result is a series of pictures of different parts or aspects of these uplands; a perfectly satisfactory treatment if you are not looking for smooth sequence and a number of things which there was not room to include.

The chapters are not chronological or geographically in sequence, but if each one is read separately, as a unit in itself, then it is interesting and enjoyable. We are given the history of the missions in California, the history of the Indians, the geological story, and a chapter on climate, the last two placed purposely at the end of the book. We are introduced to the people of the Sonoma hills, of Oregon, of Washington, and to the loggers of the Northwest coastal forest. We learn of the flowers, are given glimpses of the wildlife, and an enthusiastic sketch of the Olympic Mountains and what is found there. Some may question why there should be a chapter on California writing—what has it to do with the mountain ranges? Apparently the editor feels that without the hills the writing never would have been, and perhaps he is right. Just as the missions developed among the hills and thus became part of the story of those hills. Sometimes however, this nonsequential variety bothers the reader.

Because of the many contributors, in the actual writing there is great variety too. It is obvious that each chapter has been written with enjoyment, and as the subjects are interesting, the net result, in spite of the drawbacks, makes lively and pleasant reading. H.T.P.

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THAT'S HOW THEY NAMED IT. *Names on the Land. By George R. Stewart, Random House, New York,* 1945. *Price,* $3.00.

Can you visualize a map of the United States without any of the place names which give a map expression, life, and meaning? Then if you begin to wonder how the names of states, cities, rivers, mountains, came into being and application, you will find in *Names on the Land* the answers to nearly all your questions. It is an absorbing account of the many factors which enter into naming—the casual incidents or associations which become fixed in usage and develop into names which now stand permanently all over that once blank map.

As Mr. Stewart explains, names come from many sources. Sometimes they are simple description, or identifying tags for useful places. They can be reminders of incidents important to those who gave the name, or they can perpetuate the memory of beloved scenes in the "old country," whether it be England, Germany, France, or any other. Often they are a tribute to great men—or to lesser heroes whose deeds are perhaps forgotten but whose names remain.

The early settlers of the American continent followed all these procedures, and others as well, in naming their towns and the natural features which surrounded them. Rivers were important and always were given names—but the larger ones sometimes were variously called at different points, and it was many years before they were fully explored and given the same name through-

out. Mountains, being merely land masses without use to the hunter or farmer, were seldom named at all by the pioneers, except for a few outstanding high peaks.

The names of our three most western states in themselves show great variety. California, title of an imaginary land in a fabulous romance, was mentioned by Cortes in jest and applied first to the tip of Lower California, in the misapprehension that it was an island. About Oregon Mr. Stewart says, "Over the source of this name more controversy has raged than over any other on the continent." His version is that it developed from the mistake of a French cartographer in writing the river "Ouisconsink" as "Ouriconsink"; the syllable "sink" was later dropped, and "Ouaricon" finally became "Oregon" in the accounts of Major Robert Rogers and his follower, Jonathan Carver. It was first proposed to call the most northwestern state Columbia, but that was discarded to avoid confusion with the District of Columbia. There was evidently no realization of the even greater confusion to arise from another Washington, and the commendable intention to honor our first President has resulted in the awkward necessity of mentioning "Washington state" or "D. C." to identify either.

Mr. Stewart's book covers every section of the United States, tracing the evolution of countless names with a wealth of historical detail and anecdote. It is fascinating to read, and a valuable source of information on the origin of American place names.

VIVIAN G. SCHAGEN

* * *

WHEN REDWOODS TOOK TO THE SEA. *Ships of the Redwood Coast. By Jack McNairn and Jerry MacMullen. Stanford University Press, Stanford University, California.* 1945. x + 156 *pages; photographs and sketches. Price,* $3.00

Jack McNairn tells us in the preface to *Ships of the Redwood Coast* that the idea for the book originated many years ago when the little wooden steam schooner *Svea*, with a huge load of lumber, cut across the bow of his ship as it stood into San Francisco. Visits with the *Svea's* master some years later brought forth yarns that started the search for more information about the ships that had sailed the coastal waters of California, Oregon, and Washington. Little had ever been printed about them, so this search involved hunting up the men who had operated these ships and getting their stories, delving into the shipping pages of old San Francisco newspapers and the records of old companies. The result was an attractive book that sets down the history of coastwise shipping, in readable style spiced with plenty of yarns and anecdotes.

The hero—or heroine—of the book is the little steam schooner that defied the heavy breakers, strong winds, and almost perpetual fogs of California's northern coast to bring out the redwood that was so important in building the state. The ship was small, we learn, "because it had to be; you just don't go puttering around through breakers and into wind-swept dog-holes on the Mendocino shore in a liner or a 10,000-ton freighter—for much the same

reason that you avoid driving an automobile through the revolving front door of the Palace Hotel."

Interesting chapters deal with the evolution of the steam schooner; disasters and shipwrecks—and there have been many of them;—building of the Mendocino mill towns; the men who built coastwise shipping and the men who sailed the ships. Useful information is to be found in the appendix, and the book is well illustrated with photographs and with attractive sketches by Jerry MacMullen, similar to those in his "Paddlewheel Days in California."

B.S.

* * *

FIRST MEN TO CANADA. *The Discovery of Canada. By Lawrence J. Burpee. The Macmillan Co., Toronto,* 1944. *Price,* $3.00.

All of us delight in reading of new ascents, the discovery of new routes up a mountain or the finding of a new island or hitherto undiscovered lake. There is the same appeal in the romance of the early discovery of any country, and Canada is no exception. This book is not a dull chronological statement of Canadian exploration. Instead, the author tells the story as much as possible by describing, through the diaries and journals of the men who did the exploring, the lands they found and the hazards they experienced to find them. Beginning with Leif Ericson and the shadowy suppositions about just where he did land, and progressing to later explorers, Champlain, La Salle, and others, we are taken westward to Hudson Bay and the plains, and finally to the Pacific coast, where we meet many even more familiar names.

The author has felt that if each discoverer "as each part of Canada, east or west, north or south, became known," was allowed to tell the story of his discovery himself, it would make the tale that much more interesting. This he has done, and he is right—it makes each one of these really intrepid men live for us these many years after, and gives us a picture of the early history of the great country north of us that we could get in no other way.

H.T.P.

* * *

A GUIDE FOR THE NOVICE. *Hunting, Fishing and Camping. By L. A. Anderson. The Macmillan Company, New York.* 1945. 214 *pages, illustrated. Price,* $1.95.

Although this is written primarily for the Eastern sportsman, it is a good little book for any novice who is just about to set forth on his first hunting, fishing, or camping trip. There are chapters on deer, grouse, and duck hunting, with valuable tips on all phases of the sport—suggestions which would save the amateur many painful moments of learning by experience. Fishing is taken up in the same way—how to cast, the problems of bait and flies, trout and other game fish, and many general tips on how to catch them. The final chapters on camping are written, as is the whole book, from the experience of the Eastern camper, but basic hints and suggestions are, of course, good for any part of the world.

The veteran in hunting, camping, and fishing will hardly find this book of much value, except, perhaps, as a reminder of certain things he may have forgotten. Yet, even the most self-sufficient old timer can usually discover, if he is willing or open minded—which usually he is not—some useful suggestion that will add to his store of outdoor knowledge. H.T.P.

* * *

AT HOME IN A WILDERNESS. *Driftwood Valley. By Theodora C. Stanwell-Fletcher. Animal Sketches by John F. Stanwell-Fletcher. Little, Brown, Boston.* 1946. xiv + 386 *pages. Price,* $4.00

Not many white men, let alone women, could have survived in the uncompromising wilderness in which the Stanwell-Fletchers made their home for two years. But these two were resourceful and courageous, and—more important—they deeply loved and understood each other.

To begin with, both were naturalists with wide experience in living and collecting in out-of-the-way places. To carry on studies "somewhere in the wilds of British Columbia" had been, for both of them, a long-cherished dream. So it was almost inevitable that, after they had met and married, they should share and together realize that dream. They went into a practically unknown region of northern British Columbia, far beyond the last white settlement, and built themselves a wilderness home. There they not only kept themselves alive and reasonably safe in an unusually difficult environment, but they also studied, described, sketched, photographed, and collected the wild life of the region.

The book which describes their daily life is made up of excerpts from Mrs Stanwell-Fletcher's diary, and is illustrated with remarkably arresting sketches by Mr. Stanwell-Fletcher. From day to day are recorded the journey into the wilderness, the selection of a site and the building of their cabin, the coming of winter and the sheer difficulty of finding enough food and cutting enough wood to keep alive, the coming of summer and with it short and long collecting trips into the surrounding woods and mountains.

Wild animals were the scientists' neighbors. Their only visitors were two or three Indians whose trap lines brought them occasionally into Driftwood Valley. The outside world was as remote as it was unknown; word from home might reach them by improbable routes a couple of times in a year. For a month or more at a time the naturalist couple would be without human contact. Perhaps for this reason, perhaps because of a peculiarly sympathetic yet unemotional approach, the author seems almost to regard the animals as other people. The dogs and—in summer—the pack horses were obviously members of the family, the birds and mammals about the cabin were beings whose intelligence might be regarded as different, but not necessarily lower.

Again and again the reader senses the naturalists' effort to have the animals understand them, rather than the other way around. One of their greatest joys was to find evidence that their wild neighbors were accepting the presence of the humans. It is impossible not to share the author's admiration for the magnificent, intelligent wolves, for instance; and toward the end of the book one is compelled to read faster and faster to find out if "J." ever established suf-

ficient rapport with these wariest of animals to photograph them successfully.

"Driftwood Valley" is recommended reading for anyone who doesn't mind being unable to lay it down unfinished. C.E.M.

* * *

THE ROCKIES. *The Rocky Mountains. By Wallace W. Atwood. The Vanguard Press, New York.* 1945. 324 *pages, illustrated. Price,* $3.25.

This is hardly a book about the Rocky Mountains. It is an inspirational, slightly sentimental book about mountains in general with a few chapters on mountain building and erosion. True enough, the examples and illustrations are chosen from the Rockies, mostly from the Colorado ranges.

An author should never be criticized for not writing the book we wanted, but this comes to us as the third volume in the American Mountain Series and it bears an inclusive title. We have a right to expect more information. We get a little geology (the author is a geologist), a little love of the outdoors, a little folklore, and not very much about the mountains themselves. Only a few of the many ranges that make up the Rockies are described and most of these quite briefly. There is little or nothing about plant and animal life, nothing at all about mountain-climbing and winter sports or even about walking on the trail. The author is strictly a horse mountaineer—understandable, but it leaves the book incomplete. And in his heart of hearts he doesn't approve of climbing. "There is no need of risking one's life to see and enjoy the Tetons; in fact, those who see them from a little distance probably gain much more of inspirational value than those who scale the rugged mountains."

Presumably the publishers are out to polish off this series quickly. This one volume covers the entire Rocky Mountain system from New Mexico to Alaska; enough material has been passed up to make several good books, each larger than this one. There should have been at least three, say one for the mountains of New Mexico, Colorado, and Utah; another for Wyoming, Idaho, and Montana, and a third for Canada. Mount Robson is pictured on the dust jacket, but the text contains only a few stray notes about the Canadian Rockies. Fourteen national parks and a few other places are described in twenty-five pages. The section entitled "Why National Parks?" consists of one paragraph and a quotation from William Cullen Bryant.

Other volumes in this series have been symposia, written by a number of people each expert in a particular field. Let us hope the editor returns to that plan. The present book is out of place in the series. With a few changes it might have been a very good book to interest boys in geology and the outdoors, but it doesn't tell us what we want to know about the Rocky Mountains.

A.F

* * *

KING'S MOUNTAINEERING. *Mountaineering in the Sierra Nevada. By Clarence King. Edited and with preface by Francis P. Farquhar. W. W. Norton, New York.* 1935, [*Second printing,* 1946.] 320 *pages, illustrated. Price,* $4.00.

There is nothing that can be said here about Clarence King's *Mountaineering* that has not been said before, except that a new printing of the 1935 edition

is now at hand. Attractive and well illustrated, it tells a story of early exploration of the Sierra, of dramatic ascents, and of classical characters of the 1870s which seems never to grow older with time. By now a complete set of editions and reprintings of *Mountaineering in the Sierra Nevada* fills the better part of a library shelf. At least one edition should be in the collection of every person who knows, or hopes to know, the Sierra. D.R.B.

* * *

STARR'S GUIDE. *Guide to the John Muir Trail and the High Sierra Region. By Walter A. Starr, Jr. Sierra Club, 3d edition,* 1946. xii + 152 *pages, map. Price,* $2.00

The Yosemite Valley Railway has disappeared, a highway has been built into Kings Canyon, what was once General Grant National Park has become the General Grant Grove of Kings Canyon National Park—these and other minor changes have been made by Walter A. Starr, Chairman of the Trails Committee of the Sierra Club; and his son's guide, since 1934 a standard item for those who travel the Sierra trails, is up to date again, complete with the revised and complete three-color map in the back-cover pocket. Constant demand for the book says all that need be said with respect to its excellence.

D.R.B.

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